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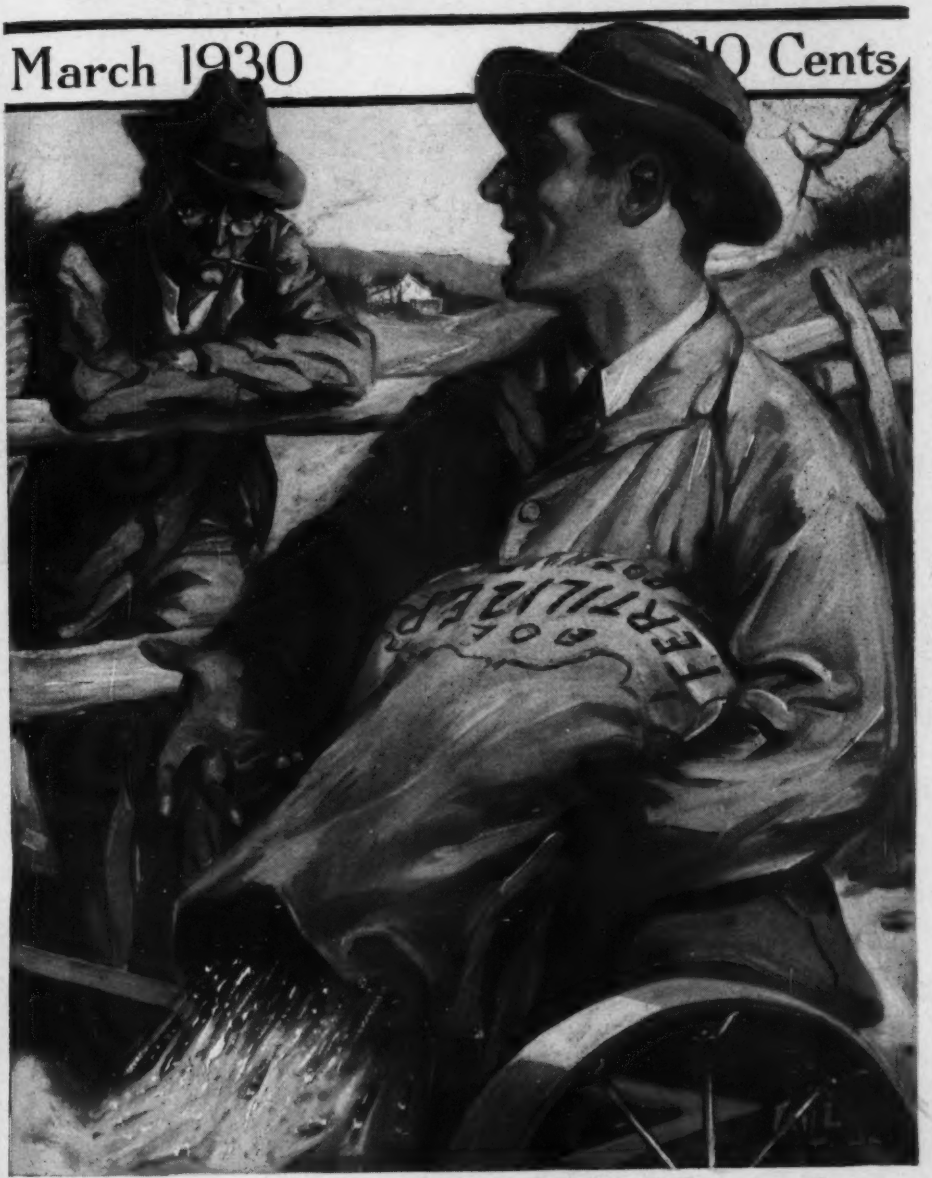

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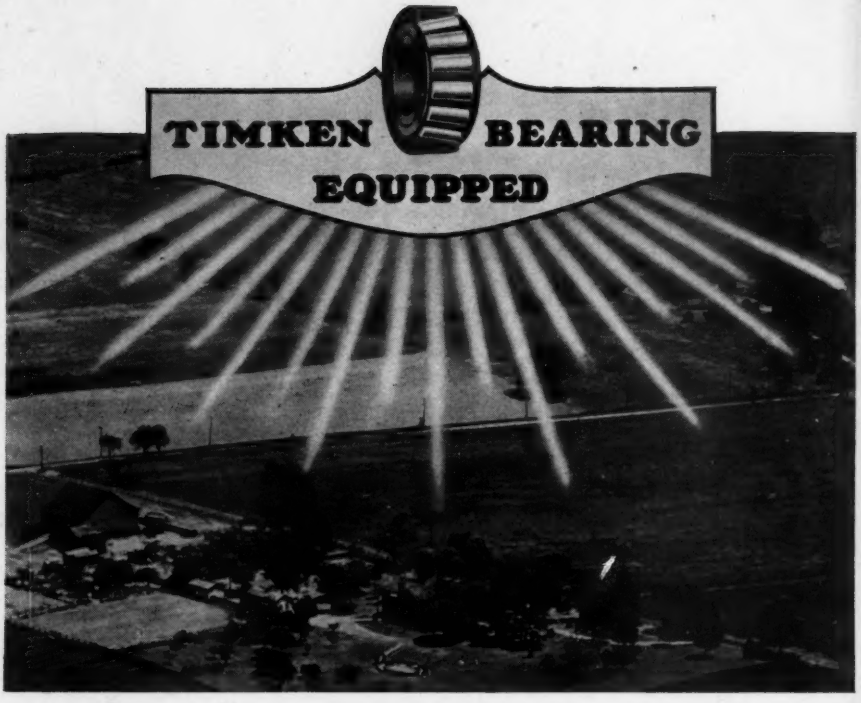

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Editorial Offices: 19 West 44th Street, New York

VOLUME XIV NUMBER THREE

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GOING NORTH—ONE OF THE FIRST SIGNS OF SPRING

Better Crops with PLANT FOOD

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VOL. XIV NEW YORK, MARCH, 1930 No. 3

Jeff is for and against—

Non-conformists

By Jeff McDermid

AS the stone-cutter carves "Hic Jacet, the Hick" on the monument of farm progress we might as well pause and get the viewpoint of the protesting minority, who refuse to bury their ancient opinions in the grave of the obsolete hayseed. To a candid reviewer there is no treason whatever in mellow retrospect.

Gomorrah somehow must have appealed to Lot's wife, but she met a briny fate because she seemed to be a non-conformist. If worst comes to worst in my case, I pray it may be limestone—for the land's sake.

What has happened to the farmer of the Midwest who used to trim his beard on national holidays and who maintained a small herd of cattle partly for sentimental reasons? What has happened to this uncompromising yeoman whose father fared overland in a prairie schooner, and who believed that nine o'clock of any evening was the proper time for winding the mantle timepiece and barring the homestead doors?

The selfsame national spasm for standardization, modernization, and efficiency which has forced all the once happy small-town merchants into lunch clubs and chambers of commerce is driving the old-time, bucolic, turkey-in-the-straw style of farmer from the smiling countryside.

Behold! the rural Renaissance! The most powerful public agencies of education and communication are devoted to its creed. What can the stubborn non-conformists do to dodge the steam roller if they deny the new cult of the cultivator? Their futile resistance sets them in the spotlight as horrible, decadent, archaic examples of the shiftless era of tillage.

If a few remnants of the passing order manage somehow to make pecuniary profits at the plow, that fact is relegated to the attic, while those who "join up" and "come across" in the accepted fashion have their successes displayed on the front porch of publicity. The cow that is fed at a profit by a Mid-Victorian farmer in a shabby frame barn minus stanchions and a silo seldom gets the blue ribbon. The man who fails to mention the vitamin content of the milk his herd produces is advised by science to take a course in high power advertising or else quit dairying.

THE farmer's vocabulary is limited, we hear, unless he speaks of amino acids, the metabolism element of minerals in rations, and the values of foods and feeds in terms of fat-soluble A and water-soluble B. He must assume his own enhanced responsibility as an expert technician, and at the same time be held under ignoble suspicion as a frequent contributing factor to malnutrition, beriberi, ptomaine poisoning, trichina, hookworm, and rickets!

"Hic Jacet, the Hick" is the legend graven on the monument of progress. We all helped put it there. Perhaps few of us would erase it, even if the letters *could* be removed from the resistant granite.

Nowadays the farmer is a gentleman in the latest meaning of the word. Do not confuse him with the awkward rube who eked out an existence in the days of ear-muffs and husking bees. Some of them still "eke" no doubt, but they do it to the tune of "Singing in the Rain" via radio! Alfalfa today is a legume, not a mark of hirsute paternal majesty. The Gillette has got many a goat, and even the female of the rural species awaits her turn at the barber shop. Appearances count, says the converted countryman; whereupon, veneered with outward culture at least, he attends the chamber of commerce banquet, and is there extolled and defended—and too often paternalized and then whipsawed into political cordwood!

WOE to the conscientious objector in agriculture who persists in growing whiskers or wearing overalls to meeting, or who feebly inveighs against lip-sticks, cement roads, and consolidated schools!

There is no use in his trying to prove by the album of his New England ancestors that they were gentlefolk in spite of linsey-woolsey, hickory shirts, and Greeley whiskers. His forebears were frumps and his cause is lost!

Under the spell of the rural vocabulary that must be adopted for the sake of caste and commerce, our poor stuttering objector gives way aghast. Herein lies the reason why the stage comedian of today seldom makes a hit with the Si Plunket brand of monologue. He is presenting a type which many of us are trying hard to live down.

Verily, the cracker barrel congress lives chiefly in the imagination of the "colyum" conductor, and even that versatile genius must search old files for local color. The founders of farming used a simple language, filled with dynamic idioms and redolent of the soil. The modern accepted agriculturist is taught to use terms which are semi-scientific or pseudocultured. It is all right to be trite and dull these days if you avoid the "Hey Rube" phraseology.

Sad to say, however, the rural Renaissance has all but smothered rus-

(*Turn to page* 61)

POTASH

By Otto I. Bergh

Superintendent North Central School and Station,
University of Minnesota, Grand Rapids, Minnesota

"JIM" HILL, the "Empire Builder," was intensely interested in the agriculture of the great Northwest. Back in the eighties and early nineties of the past century, he was introducing into that territory, on a gigantic scale, the best blooded cattle, swine, and sheep imported from abroad in order to develop a broader and better balanced industry. It was therefore not at all surprising, when the phosphate deposits in Montana were discovered some 20 years later, that this keen visioned man should launch a soil fertility project of a magnitude far beyond that usually attempted by State and Federal departments of agriculture.

The results from these soil fertility trial fields throughout the vast territory served by the Great Northern Railway revealed many soil areas deficient in phosphorus. Several of these are in Minnesota. The most outstanding, perhaps, is a belt extending from the Red Lakes to Lake Traverse and beyond, paralleling the upper beaches of the extinct glacial lake, Aggassiz.

Following closely upon the investigations by the Great Northern Railway Company and to supplement and confirm the results, the Division of Soils of the University of Minnesota laid down long-time phosphate projects at each of the six Minnesota Experiment Stations located as follows: St. Paul (Central); Morris (West Central); Crookston (Northwest); Grand Rapids (North Central); Duluth (Northeast); Waseca (Southeast). These projects included applications of phosphates in the form of both raw rock and superphosphate, used in combination with farm manures as well as alone. The treatments

The experimental field on August 15, 1929. The potato plants in the center plot (left) receiving no potash are completely wilted and withered. Plants on adjacent plots treated with potash are still growing vigorously.

Otto I. Bergh, Superintendent, North Central School and Station.

were alike at all stations. The crops grown and rotations adopted, were those suited to the general type of farming in each district.

You may ask, "What have phosphate trials to do with 'Potash,' the subject of this story?" Possibly nothing at any of the stations except the one at Grand Rapids. Here these trials came to be, as it were, a stepping stone for further research, particularly with potash.

The project laid down at Grand Rapids had six treatments including the check plot, as follows:

1. No treatment.
2. Rock phosphate, 2,000 lbs. per acre.
3. Rock phosphate, plus 10 tons of stable manure.
4. Stable manure alone.
5. Stable manure plus superphosphate, 360 lbs. per acre.
6. Superphosphate alone.

All of these treatments were repeated three times making 18 one-tenth acre plots to a series. There were three series to accommodate a rotation of potatoes, oats, and hay (clover and timothy). The superphosphate and manure were applied once in the rotation preceding the potato crop. The raw rock phosphate was put on in 1914 and none thereafter.

The area selected for the project is well drained, having a definite and fairly uniform slope toward the north. The soil is a silt or fine sandy loam. The land formerly bore a heavy stand of white pine, and hardwood timber, including some oak. This timber had been cut and the land cleared some 15 years previously. It had been cropped to oats, potatoes, and clover, and occasionally had received applications of stable manure.

The soil was in a fair state of fertility, as indicated by the yields from the check plots. During the first six years, 1915-20, these check plots produced an average yield of 130.2 bushels of potatoes per acre. Those that received raw rock phosphate at the rate of a ton per acre in 1914 yielded 146.1 bushels. Those receiving 360 pounds of superphosphate each third year yielded 146.4 bushels. The plots with stable manure plus raw rock phosphate produced 224.7 bushels; manure with superphosphate, 235.9 bushels; and manure alone, 229.6 bushels per acre.

Why the Benefit from Manure?

The benefit to the potato crop from stable manure was so great that the first year's results were doubted. It was therefore determined to weigh the

potato crop from each row separately, so that the yield from each tenth-acre plot would be a composite from 11 weighings and the yield for each treatment would represent the average of 33 weighings for as many rows. Through these individual weighings, it was discovered that the outer rows of the raw rock and superphosphate plots adjacent to those receiving stable manure were favorably affected by the manure treatment and that there was little or no benefit from the application of either raw rock or superphosphate. The oats and hay crops, however, did show definite and favorable effects from both phosphate treatments, but much less so than from stable manure.

Why, we asked, is the potato crop so greatly benefited by stable manure as to almost double the yield? Is it the addition of organic matter resulting in better aeration of the soil; the conservation of moistures; the stimulation of bacterial action and more uniform soil temperatures; or is it because of the addition of some plant food element that the soil lacks?

To answer the question as to organic matter, a project was laid down to compare applications of raw peat with stable manure. This project included six treatments as follows: no treatment; stable manure 5 and 20 tons per acre; and raw peat 10, 20, and 40 tons per acre. The crops and rotation were the same as in the phosphate and manure project. Aside from this, since the soil showed a lime requirement of from two and three tons per acre, lime was applied on the north half of all plots in all three series of both the peat and the phosphate projects. This liming showed no benefit to either the potato or oat crops, but was perceptible in a slightly more vigorous growth of the clover in the hay crop. The lime treatment also occasioned a tendency to scab on potatoes under the heavy manure treatment.

The average yields of potatoes, oats, and hay over a nine-year period 1915-23 are shown in the following table:

	Potatoes		Oats		Hay	
Treatment	Yield Bu.	Increase Bu.	Yield Bu.	Increase Bu.	Yield Lbs.	Increase Lbs.
Check	108.6	....	37.4	...	2600	....
5 Tons Manure ..	177.4	68.8	41.94	4.54	3400	800
20 Tons Manure ...	252.2	143.6	44.60	7.20	4320	1720
10 Tons Peat	113.7	5.1	38.68	1.28	2900	300
20 " "	119.7	11.1	40.04	2.64	2880	280
40 " "	124.8	16.2	41.40	4.00	3020	420

Potash made the difference.
Irish Cobblers—Yields from two 4-rod rows. Left—fertilized with N, 200 lbs., P, 360 lbs. Right—fertilized with same plus 230 lbs. of potash.

These yields show that 20 tons of manure per acre increased the yield of potatoes from 108.1 bushels to 252.2 bushels, an increase of over 133 per cent. Twenty tons of raw peat increased the yield only 11.1 bushels, or about 10 per cent over that for the check plot. For oats, 5 tons of manure were more effective than 40 tons of raw peat, and were almost twice as effective for hay. It is clear, therefore, that the benefit from the manure cannot be attributed to the addition of organic matter, though some benefit did apparently result therefrom.

Potash Starvation Signs

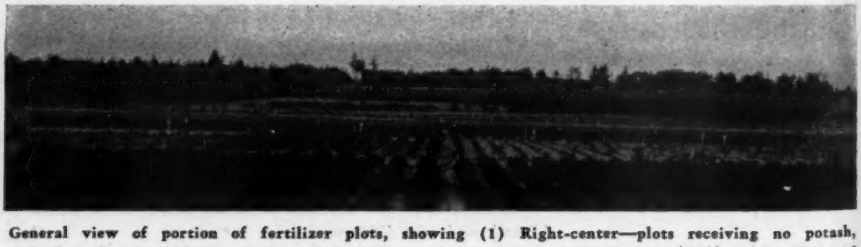
The original phosphate-manure project begun in 1914 was therefore modified in 1920 by the addition of a mixed nitrogen fertilizer, equivalent to 200 pounds of ammonium sulphate per acre, on the east half of each of the three check plots. The rock phosphate plots received 320 pounds muriate of potash plus 360 pounds of superphosphate per acre, and on the west half of these plots was added a mixed nitrogen fertilizer equivalent to 200 pounds of ammonium sulphate. Superphosphate and manure were applied on the plots originally treated with rock phosphate and manure. The plots formerly receiving manure alone, as well as those receiving manure and superphosphate, were treated as before. The plots originally receiving superphosphate alone, were modified by adding nitrogen on the west half of each plot.

How little did we anticipate at planting time that year, 1920, the surprising story that those potatoes would tell. Hardly had blossom time arrived when the foliage of the plants on the plots receiving neither manure nor potash commenced to show a deeper green. Later the leaves began to buckle and warp. The vines appeared contracted and stubby. As the season progressed, the leaves turned still darker green, some finally changing to a metallic bronze. The buckling in many cases had developed into a curl. The change was most marked on the plots that had been given nitrogen. The tuber set, however, appeared normal with a particularly heavy set under the hills on the nitrogen plots.

The Yields Tell Story

The vines on the manure and potash plots, on the other hand, were spreading; the leaves were open and of a limpid green with a suggestion of yellow and orange, as though beginning to ripen. However, these plants continued to mature slowly, and were still green when those on the plots receiving neither manure nor potash had turned brown and sear. During the late summer, the appearance of the field suggested a barred scarf with bands of different shades of green. Farmers viewing the field would invariably ask "What sort of potatoes are growing there?" And as invariably would they react as if they were the butt of a joke, when answered, "Those are all green mountains."

Were the dark green vines of summer a promise of a bounteous harvest? The crop bore witness as follows:



General view of portion of fertilizer plots, showing (1) Right-center—plots receiving no potash, (2) Center-center—plots receiving ½ N-P-K), and (3) Foreground—plots treated with muriate of potash at 230 lbs. or more per acre.

Plot No.	Treatment	Ave. Yield Two Years Total Bu.	Total Increase or Decrease over Check Bu.	Yield Marketable U. S. No. 1 Bu.	Increase or Decrease over Marketable Bu.
1a-7a-13a	O	113.40	....	64.70	....
1-7-13	N	116.90	3.5	65.40	0.8
2a-8a-14a	P-K	170.80	57.4	138.90	74.3
2b-8b-14b	N-P-K	213.40	100.0	171.60	106.9
3-9-15	M-P	214.80	101.4	174.80	110.1
4-10-16	M	223.70	110.3	186.10	121.4
5-11-17	M-P	228.90	115.5	189.00	124.3
6a-12a-18a	P	109.30	–4.1*	64.50	–0.2*
6b-12b-18b	N-P	128.60	15.2	76.20	11.6

*Decrease per acre as compared with the plot receiving no treatment.

These results indicate:

1. No definite benefit to the potato crop either from the nitrogen or phosphate fertilizers, where these were used alone.

2. A slight increase when nitrogen and phosphate were combined.

3. Large increases from muriate of potash as well as from stable manure.

4. Potash in combination with phosphate gave an increase of 57.4 bushels per acre in the total crop and 74.3 bushels in marketable tubers (U. S. grade No. 1), indicating a marked increase in the size of the tubers.

5. The complete fertilizer mixture, containing nitrogen as well as phosphate and potash, increased the total yield 100 bushels, and the yield of marketable tubers 106.9 bushels, 95.3 bushels more than the increase from nitrogen and phosphate without the potash.

6. An increase of 42.6 bushels total yield and 32.3 bushels of marketable tubers resulted from the addition of nitrogen, when combined with both phosphate and potash, as against an increase of only 3.5 bushels in the total yield and 0.8 bushels of marketable tubers when the nitrogen ferti-

The Administration Building, Agricultural School and Experiment Station, Grand Rapids, Minnesota.

lizer was applied alone.

Soil experts, as well as many a farmer, have expressed astonishment at the large increase of potatoes resulting from the applications of stable manure. In explanation we have called their attention to a concrete manure storage and have told them of its origin as follows:

While standing in the shade of these pines one warm sunny day in July 1915 and looking down on that field yonder that for several years had been rented by the station for meadow and fall pasture, I saw small, green patches of tall grass distributed quite uniformly over the field, possibly a dozen or more to the acre. They were rough, triangular, or diamond-shaped areas, two to three feet long. They aroused my curiosity. I walked into the field. The grass was sparse and short except for those miniature green islands. Why these luxuriant spots? Were they caused by the droppings from the cattle pastured here last fall? In the sparse grass the chips were easily found. Only occasionally was one found surrounded by luxuriant grass. Most of them were not. Decidedly! It was not the droppings, but urine that caused this luxuriant growth.

Until then, the manure from the dairy barns had been dumped down the hillside winter after winter, a 1,000 tons per year. The best of it never reached the fields. Possibly 70 per cent of the potash and half the nitrogen were lost. Hence, that 1,000-ton storage, the reason why a ton of manure spread on the fields at this station is "legal tender" for 7 to 14 bushels of potatoes.

Not only was the concrete storage resorted to in order to conserve the potash and the nitrogen in the manure, but peat was liberally used in the gutters as an absorbent. The quantity of straw available for that purpose was limited and besides, peat was found to be more satisfactory and efficient.

Actual tests show that 100 pounds of dry peat will absorb and retain from 10 to 13 gallons more liquid than the same weight of straw. It is also more easily handled and the spreader distributes it more evenly on the field. Preparing peat for barn litter is fully discussed in Minnesota Experiment Station Bulletin No. 212, pages 52-55.

Other Projects

Building on the results from previous trials, other projects were laid down. These had in view the following purposes:

1. To determine the influence of potash when used in combination with stable manure upon the yields of potatoes, oats, and hay, grown in a three-year rotation.
2. To note the effect upon truck and garden crops from a complete fertilizer high in potash, used at different rates, both alone and in combination with stable manure.
3. To compare the effect of nitrogen, phosphates, potash, wood ashes, and lime, applied alone and in combination on a permanent meadow and pasture of mixed grasses and legumes.
4. To note the effect of various fertilizers on different crops grown on low-lime peat land.
5. To set up a commercial project arranged to bring out as strikingly as possible the effect of potash, that previous projects had shown to be such an important ingredient in farm manure and in mineral mixtures.

The Effect of Potash

Since this last project particularly stresses Potash, the subject of this story, we shall here confine our discussion to it; though the other projects revealed facts equally as interesting and important.

This project comprises three series to accommodate a rotation of potatoes, oats, and hay. Each series consists of 20 plots in 10 pairs. The north plot of each pair receives the same treatment as the south plot and

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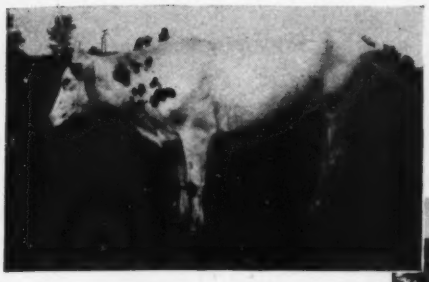


SHE LIKES THE TASTE OF FERTILIZED PASTURE.

Left: This picture shows how poorly the cattle grazed the unfertilized pasture on the Brandon State School farm, July 26, 1929.
Below: This shows the closely grazed pasture of the plot receiving complete fertilizer on the same farm, same date.

Profits *from* Fertilized Pastures

By Dr. E. Van Alstine

Extension Agronomist, Vermont

APPROXIMATELY 65 per cent of the farm income in Rutland county, Vermont, is from the sale of livestock products and of this, 65 per cent comes from the sale of dairy products and dairy cattle. Economic dairying is possible only where there is plenty of hay and other roughage feeds for winter and abundant pastures for summer feeding.

As between winter roughage and summer pastures, the latter requires less labor and supplies the cheaper feed. Moreover, the condition of Rutland county pastures is such that the cost of improvement is likely to bring as great financial returns as the same expenditure for the production of winter roughage. In many cases the need for summer feed is more urgent and the returns for the cost of improvement will be proportionately greater.

The acreage of pasture in Rutland county is quite sufficient. In fact for every 100 acres of farm land there are 44 acres of open pasture. However, the treatment this pasture has received in the past has been such that it is now depleted and so poor that it requires an average of 2.7 acres and a great deal of barn feeding during most of the summer to support one cow between the spring and fall months.

Thirty of these forty-four acres of open pasture cannot be plowed and must be improved by top-dressing or eventually abandoned. The remaining 14 acres may be improved by plowing, but in many cases top-dressing will be a more economical method. Proper improvement of the best pastures will give more and better summer feed than is now available, and many acres of rough open pasture can be turned over to forestry. The result will be better summer feed, less labor for dairy cows, and greater profits to the dairyman.

During 1929 fertilizer was applied to 22 farms in Rutland county. Typical test areas were 8 by 12 rods and consisted of 6 plots of 1/10 acre each, treated as follows:

Plot 1—Check, untreated.

Plot 2—P-superphosphate (16 per cent), 600 lbs. per acre.

Plot 3—LP-lime two tons per acre and superphosphate.

Plot 4—LPK-lime, superphosphate, and 100 lbs. muriate of potash.

Plot 5—LPKN-lime, superphosphate, muriate of potash, and 320 lbs. per acre of nitrate of soda (15½ per cent N.).

Plot 6—L-lime two tons per acre.

Fertilizer ingredients were applied at a uniform rate wherever used, the plot with complete fertilizer receiving approximately the equivalent of 1,200 pounds of a 4-8-4 mixture or 1,000 pounds of a 5-10-5 mixture. All treatments were made in the spring of 1929.

The cost of superphosphate was $6.00 per acre; of muriate of potash $2.50 per acre; and of nitrate of soda $9.60 per acre. The cost of lime was so variable, and the benefits from its use are extended over so long a period, that an estimate of its cost and of the value of returns from its use have not been attempted.

Yields were computed from clippings made during the season from areas one foot by nine feet in size included within fenced areas. The samples so collected were oven-dried, weighed, and five per cent added to make the weights correspond more nearly to weights of grass cured as for hay. The weights have been calculated to pounds per acre and reported in Table 1. Only those considered reliable are averaged.

Using only nine fields for further consideration, observation shows that there is quite evidently no benefit from lime the first year as an average of the fields. This holds true where lime is compared with no treatment, and where lime and superphosphate are compared with superphosphate alone. For this reason the check and the limed plots have been averaged together, as have also the superphosphate and the superphosphate lime plots. It should not be concluded that there will be no return from lime. Similar work carried on by experiment stations in New England has shown that lime used as pasture topdressing gives a decidedly profitable return when considered over a five-year period, although it seldom gives a benefit the first year.

In addition to the two averages showing yields with no treatment and the yields with superphosphate, it is possible to average nine plots receiving potash and nine other plots receiving nitrogen. Such averages show increases from the different treatments as indicated in Table 2. This table also shows the costs of the increases secured for each treatment.

The costs may seem excessive if they are thought of in terms of hay, but H. B. Ellenberger, in a recent bulletin on Vermont pastures, reports analyses of dried pasture grasses which show that they are more properly compared with wheat bran or alfalfa hay as regards both digestible protein and feeding value.

TABLE 1.

POUNDS PER ACRE OF HAY-CURED GRASS FROM SAMPLED PLOTS.

		Treatment					
	Cooperator	O	L	P	LP	LPK	LPKN
1.	D. J. Barnes	1255	1445	1591	2174	3305	3238
2.	A. D. Barnard	1310	1221	2632	1972	2162	2812
3.	G. A. Davis	1916	2106	2095	3507	2723	4134
4.	F. N. Mason	1826	2622	2061	2318	3092	4011
5.	L. A. Drown	2560	1512	3406	3462	4335	4750
6.	H. B. Savery	1288	1176		1199	1109	2936
7.	H. N. Dundon		1277	1905	1950	2219	3305
8.	C. J. Fox		1883		2610	2632	3227
9.	W. S. Tuttle	1087			1418	3104	3618

TABLE 2.

PASTURE TREATMENT, INCREASES, AND COSTS

Treatment	Increase in yield per acre for the treatment.	Cost of treatment per acre.	Cost of increase per ton.
	Pounds		
600 lbs. Superphosphate	600	$6.00	$20.00
600 lbs. Superphosphate 100 " Muriate of potash ...	1146	8.50	14.83
600 lbs. Superphosphate 100 " Muriate of Potash 320 " Nitrate of Soda	1963	18.10	18.44

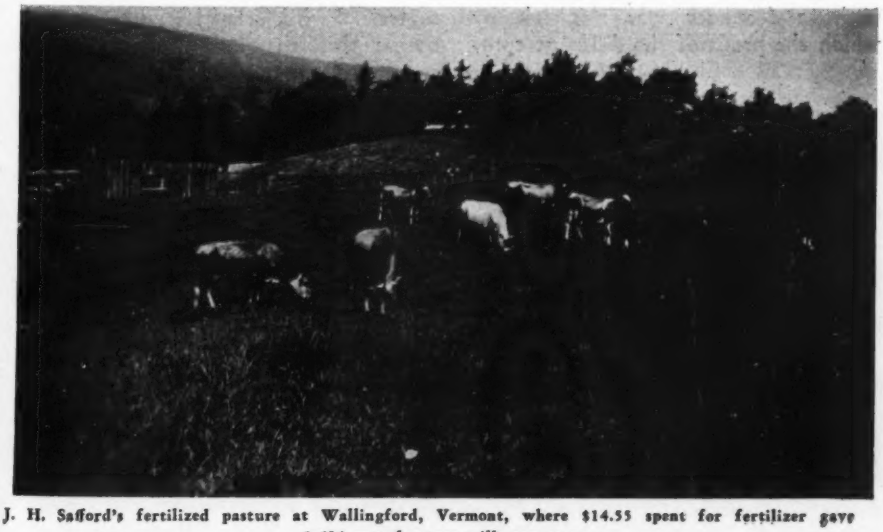
It may be calculated from this table that the increase from potash used after superphosphate cost $9.16 per ton; the increase from nitrogen used after superphosphate and potash cost $23.50 per ton as compared with a cost of $20.00 for superphosphate alone.

The superphosphate was used in amounts expected to last three years, therefore its cost would be somewhat lower for each season provided it should last as expected. With nitrogen the cost of increase would be lower and more economically obtained if less nitrogen had been used or if it had been distributed in two or more applications during the year.

It is planned to increase the amount of potash to 200 pounds per acre after the second year so as to determine the increase that may be secured with larger amounts, as well as to see what effect it will have on the cost.

Observations during the year showed that on the very light sandy soils no perceptible benefit was obtained with any treatments that did not include nitrogen. On good sandy loam soils, potash nearly always gave a perceptible increase in the stand of clover and frequently phosphoric acid did. On all types of soil, nitrogen gave a rapid early growth and not only made it possible but necessary to begin pas-

(*Turn to page* 48)



J. H. Safford's fertilized pasture at Wallingford, Vermont, where $14.55 spent for fertilizer gave 1,694 pounds more milk per acre.

Fertilizers Improve Kentucky Tobacco

By E. E. Pittman

Elizabethtown, Kentucky

FIGURES secured from demonstrations in several counties of Kentucky during the 1929 growing season can be turned into profits by Kentucky tobacco farmers during 1930. These demonstrations were carried on in cooperation with prominent tobacco growers. Thus the plant food needs of tobacco were studied under many and varied conditions.

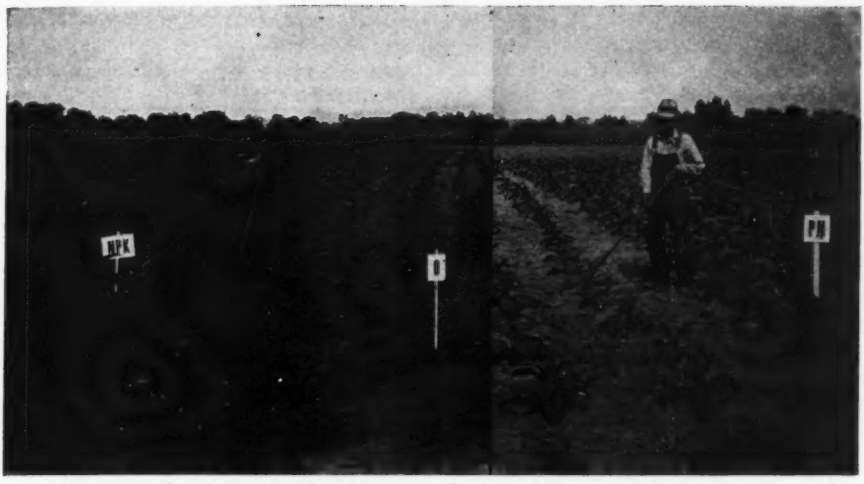
The method of conducting these demonstrations was to use four analyses of fertilizers: 3-8-0, 3-8-6, 3-8-12, and 3-8-24. These were carefully built up so that the drills would deliver the same amount of each one on an acre. The same amount of each one of these fertilizer analyses was put on each of similar plots and always some plots were left on which no fertilizer was used. These were called the "no treatment" or "check" plots because the tobacco grown on them without fertilizer was a check by which the profit of the different combinations could be gauged.

In planning these analyses, the purpose was to supply in each one enough nitrogen and phosphorus to give the plants their fill of these two elements, and to vary the amount of potash available to the plant. Then the plant growth was to be watched, particularly the thinness and oiliness or shade of green of the leaves. Any differences, if possible, were to be correlated with the appearance of the leaves after curing, as it long has been believed that available plant food has much to do with the color, the size of leaf, and the aroma of smoking tobacco.

It should be remembered that in a fertilizer analysis such as 3-8-24, the first figure, 3, means that there are 3 pounds of nitrogen in each 100 pounds of material, the second number, or 8, means that there are 8 pounds of phosphoric acid in each 100 pounds of material, while the last figure, 24, means that there are 24 pounds of potash in each 100 pounds of the goods.

Warren county, Kentucky—Tobacco hung in the field for partial curing.

The method of measuring the quality of leaf produced by the various plant food combinations was to put the grade right over the auction floor and let the buyers "say it with bids." All conditions in each field were kept the same — same kind and age of plants, same kind of plowing and cultivation, all plots harvested at the same



Left: 400 pounds of 3-8-12 produced 1,830 pounds of tobacco leaf worth $223.46 per acre. Right: 400 pounds of 3-8-0 produced only 1,700 pounds worth $191.59 per acre.—Western Teachers' College, Bowling Green, Kentucky.

time and given the same conditions of storage.

The tobacco produced by each plot was kept separate and then at stripping time, it was divided into different grades and even the small lots of the various grades were put right over the auction floor. It will be seen that the price of each grade was determined by the tobacco buyers, whose vast experience in buying leaf day after day has taught them to detect quality in tobacco leaf at the first glance. The average price secured for the grades produced by each plot is used as the average price of the tobacco grown on that plot.

The first four demonstrations reported are on *burley* tobacco, the last is with *dark*.

T. H. Devore, a prominent tobacco grower of Owen county, Kentucky, grew his tobacco on a nine-year-old bluegrass sod. On the Devore farm, no fertilizer produced 720 pounds of leaf worth $204.70 per acre. Two hundred and fifty pounds of 3-8-0 fertilizer produced 1,180 pounds of tobacco worth $349.50 per acre. Both the 3-8-6 and 3-8-12 raised the yield when compared to the 3-8-0, but the highest yield came from 250 pounds of 3-8-24, which made 1,600 pounds of the highest priced tobacco on the entire plots, being worth at the rate of $464.70 per acre.

On the Lindsay Hough farm in Bourbon county, the tobacco was planted on ground that had been in bluegrass for the last 11 years. On this farm the fertilizer combinations were put on at the rate of 250 pounds per acre. On the untreated soil, the yield was 1,150 pounds of tobacco per acre with a value of $361.40. The yield was only slightly increased by 250 pounds of 3-8-0 which brought it up to 1,180 pounds of leaf per acre worth $393. The 3-8-6 swelled the yield again to 1,210 pounds of tobacco worth $398.60, but when the potash content was pushed up to 12 per cent, the highest value per acre was reached. Two hundred and fifty pounds per acre of 3-8-12 produced at the rate of 1,380 pounds of tobacco with an acre value of $414.70.

R. M. Blackerby in Lincoln county, Kentucky, put his tobacco on a field that had been in alfalfa for the last three years. Each year since 1926, he had given this alfalfa field an application of 250 pounds of superphosphate per acre.

On the Blackerby farm, 500 pounds of fertilizer per acre were used on each

of the plots. No fertilizer at all produced 997½ pounds of cured tobacco with an acre value of $170.37. Five hundred of 3-8-0 put the yield up by 160 pounds or 1,157½ pounds. The tobacco on this plot was of poorer quality, however, and brought $189.59. The highest yielding plot of the entire series was the 3-8-24 on which 500 pounds of fertilizer yielded 1,425 pounds of leaf which was worth $268.75. The tobacco on this plot was worth $98.38 more per acre than the "no treatment."

George Midden in Harrison county planted his tobacco on ground that had been in bluegrass during the last three years, getting no other fertilizer treatment than three tons of ground limestone in 1928. In all of the plots on the Midden farm, 750 pounds per acre of the four analyses mentioned were put on. The tobacco was sold at the Growers' Tobacco Warehouse at Cynthiana, Kentucky.

Bluegrass sod without fertilizer produced 510 pounds of tobacco worth $140.40 per acre. When 750 pounds of 3-8-0 were put on, the yield went up 300 pounds, or 810 pounds per acre, with an acre value of $226.98. The 3-8-6 and 3-8-12 produced a very marked increase, but the highest return per acre was on the plot that got 750 pounds of 3-8-24. On this area, the tobacco produced at the rate of 870 pounds per acre and of such quality that it was worth $267.96 per acre.

Auction floor prices obtained for the tobacco from the Midden plots are more eloquent than words as to what fertilizer in general and potash in particular did to increase the quality of the lots grown. All prices are net. The check plot averaged $27.35 per hundred; the 3-8-0 plot averaged $28.02 per hundred; the 3-8-6, $28.65; the 3-8-12, $29.51 net; while the 3-8-24 brought the most or $30.75 per hundred weight.

It will be observed that on the four *burley* tobacco demonstrations reported, a 3-8-24 brought the largest gross acre return on three. However, the 3-8-12 gave the grower the largest net profit.

Tests with Dark Tobacco

In a fertilizer demonstration on *dark* tobacco carried on in cooperation with the Agricultural Department of the Western Kentucky State Normal School, the plots were on a clay loam soil that had been growing alfalfa since 1926. No fertilizer had been applied to the alfalfa.

On the Ogden College farm, 400 pounds of each of the fertilizer analyses were applied. No fertilizer at all produced 1,320 pounds of dark tobacco worth $135.70 per acre; 400 pounds of 3-8-0 produced 1,700 pounds of tobacco worth $191.59; while 400 pounds of 3-8-12 made 1,830 pounds of tobacco leaf worth $223.46 per acre. Additional potash

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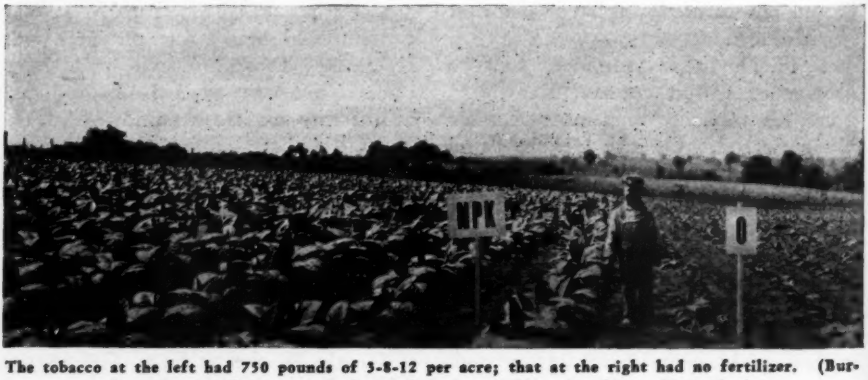

The tobacco at the left had 750 pounds of 3-8-12 per acre; that at the right had no fertilizer. (Burley tobacco, bluegrass sod, farm of George Midden, Cynthiana, Kentucky.)

The 1,358 pounds of cotton per acre (left) were grown with 800 pounds 8-4-4 plus 100 pounds nitrate of soda and 128 pounds of muriate of potash. The 875 pounds per acre (right) received no extra potash. (Farm of Z. V. Pate, Laurinburg, North Carolina.)

Top-dressing Cotton

By H. J. Maddux

Atlanta, Georgia

THERE are still some people who are wondering about the use of extra potash in fertilizing cotton and about the use of a nitrogen-potash top-dresser for the crop, but not so the farmers who have actually used extra potash.

This is a relatively new proposition. My father didn't use any extra potash on his cotton and he made good crops. Yes, but he might have made better crops. This new idea may be a good one.

Let's see what Georgia's master cotton growers, Jim Kelley of Tennille and Paul Burson of Monroe, are doing. Mr. Burson made only 161 bales on 135 acres in 1929 and won the State Contest prize with 5,283 pounds of lint on 5 acres. He used the equivalent of 1,000 pounds of a 10-7-9 (PNK) per acre on red to gray soils for most of his crops, applying half of his nitrogen and potash as a top-dresser.

Mr. Kelley produced 253 bales on 275 acres in 1929, using a top-dresser composed of 15 pounds of nitrogen and 25 pounds of actual potash. But where he tripled the potash in his top-dresser, he produced so much more cotton that he has decided to use in 1930 the equivalent of 800 pounds per acre of a 9-5-9 (PNK), with half of the nitrogen and two-thirds of the potash as a top-dresser.

Mr. David R. Coker at Hartsville, S. C., one of the most prominent cotton seedmen of the South, for several years has used a nitrogen-potash top-dresser, sometimes three applications per season, on his extensive breeding plots.

On the red soils of the Piedmont section of South Carolina, Mr. Charlie Beason of Woodruff in 1928 used an extra 66 pounds of muriate of potash per acre for his cotton with a gain of $22.68 per acre. Is it any wonder that Mr. Beason and 36 of his neighbors top-dressed their cotton crops

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"Seasoning" Corn

By L. E. Thorne

County Agent, Rensselaer, Indiana.

SEASONING with a dash of fertilizer "salts" the black sands common to northwestern Indiana, one of the most important corn growing soils of the corn belt, more than paid in an outstanding demonstration in Jasper county, Indiana, last year. This demonstration was on the farm of Amzie Schultz of Union Township, north and west of Rensselaer.

Furthermore, the particular point of interest in this demonstration was that the potash in the fertilizer could be credited with a gain of 46.58 bushels per acre worth $32.60 at the current price for corn of 70c a bushel.

In commenting on this demonstration, Mr. Schultz said, "As this demonstration occurred on my farm, I know positively that all conditions surrounding the plants were identical in so far as possible save for the analyses of fertilizers used on the different plots, otherwise, I should have been unwilling to believe that merely putting a 27 per cent potash fertilizer in place of a no-potash fertilizer could make such an amazing difference."

The seed corn all came out of the same bag. The soil was uniform and typical of that low-lying soil locally referred to as black sand. It usually contains considerable organic matter and acidity tests of this soil showed it slightly acid (pH 6.3). The Neubauer test indicated that for corn it was slightly deficient in phosphorus but decidedly lacking in potash.

Acting upon this forecast, a series of fertilizers were built up in which nitrogen and phosphorus were kept the same and the potash content varied, trying to anticipate in the series enough nitrogen and phosphorus to surely meet the needs of the crop.

Four analyses were compared, 3-9-0, 3-9-9, 3-9-18, and 3-9-27, and an 0-8-24 and 0-8-32 also were included. The rate of application was 125 pounds per acre and the same amounts of fertilizer were used under each row and all tillage operations were performed at the same time.

Jasper county embraces many soil types and during the year, one sees some very striking chance demonstrations of what fertilizers do on the soil. But the Schultz demonstration, throughout the season, was the most striking of any I ever watched. In the early summer, no very marked differences appeared between the various combinations, but the checks got off to a slow start and were not again within speaking distance of the fertilized plots. The highest yielding plots were those fertilized with 3-9-27, 0-8-24, and 0-8-32, The check plot yielded 23.28 bushels to the acre. The 3-9-0 fertilizer brought the yield to 23.97 bushels, indicating that neither nitrogen nor phosphorus was very important at this yield level.

The 3-9-9 yielded 47.12 bushels; the 3-9-18, 53.7 bushels; while the 3-9-27 made the yield of 70.55 bushels.

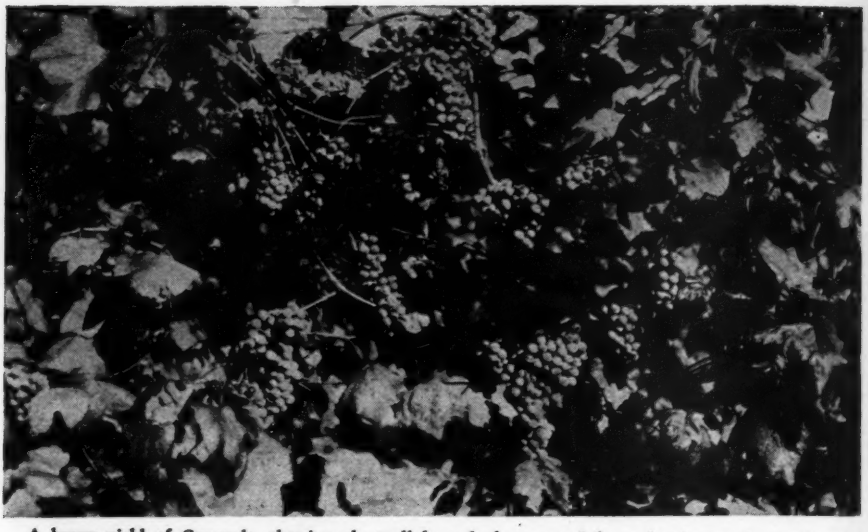
The corn fertilized with a 3-9-0 was right beside that fertilized with a 3-9-27. At harvest time, the 3-9-0 was dead and prostrate, after having grown to five or six feet in height, while the 3-9-27 was eight and ten feet high, every stalk erect and nearly every one bearing a big pendulous ear.

When the corn was shucked, the difference was 46.58 bushels per acre, worth $32.60. The only difference between the 3-9-0 fertilizer and the 3-9-27 was 27 units of potash, costing approximately $1.70.

The check plot got off to a slow start and as far as growth was concerned, was not again within speaking distance of the others. The yield was 23.28 bushels per acre.

The 3-9-0 plot (125 pounds per acre) only brought the yield up to 23.97 bushels per acre, indicating that neither nitrogen nor phosphorus was important at this yield level.

The 3-9-27 plot (125 pounds per acre) brought the yield up to 70.55 bushels per acre, a difference of 46.58 bushels per acre worth $32.60, due to 27 units of potash.



A heavy yield of Concords, showing the well-formed clusters and large berries as the result of additional potash.

Better Grapes

By Russell E. Wilson

County Agent, Dover, Delaware

WHETHER you are in favor of the Volstead Act or "agin it" the fact remains that there were 2,636,076 tons of grapes produced in the United States during the season of 1928. During that same year, we are told that the people of Canada cosumed 5,486,614 gallons of wine. BUT this shows a healthy condition, compared to former years, as the consumption of spirits has decreased per capita from 1.032 gallons in 1912 to .452 gallons in 1928, while the consumption of mild home wines has increased per capita from .122 gallons in 1912 to .557 gallons in 1928.

However, this particular article has no interest in the Volstead Act nor in the amount of wine consumed, but the fact that there were 2,636,076 tons of grapes produced in 1928 indicates very clearly that the grape industry is truly a "big business" and as such deserves considerable study and consideration.

History informs us that this country of ours was often referred to as "Vineland" because of the many wild grapes found here by the early explorers. In the olden days grapes and wine were synonymous terms and colonial literature mentions wine and wine-making in speaking of grape culture. An English sea captain tells us that the Spanish colonists in Florida made 20 hogsheads of wine from wild grapes in the season of 1565.

The early colonists brought with them the European grape and tried to establish vineyards, but with scant success. It was not until about 1880 that the grape industry began to assume any importance. In 1895 California began the canning of grapes. Commercial raisin production in California was first emphasized in 1873

when nearly 6,000 twenty-pound boxes of raisins were marketed.

Although the Far West produces the major part of the grape crop, there are many acres scattered through the eastern States. The States of New York, Pennsylvania, Ohio, and Michigan are among the largest producing States in the East.

In the State of Delaware the grape industry is centered largely in Kent county in the Dover, Smyrna, and Wyoming sections. During the past eight or ten years the acreage devoted to this crop has increased from 300 to more than 1,500 acres of bearing vines.

Along with this rapid expansion of acreage has come improved methods of spraying for the control of black rot and other fungous diseases. The control of the berry moth also has received much attention from State entomologists with the result that methods are now followed which lessen the injuries from this insect. Better cultural methods, such as legume cover crops, more frequent use of the cultivator, and more efficient pruning have increased yields and quality.

Within the past six years, therefore, attention has been given more to the fertilization problem which is of vital importance in the maintenance of the vineyards and the production of high quality grapes. Experimental work in grape fertilization in Kent county was started in the spring of 1924 when Director A. C. McCue of the Delaware Experiment Station assisted in establishing plots in the Concord vineyards of B. B. Chase and N. W. Taylor. Each plot in these vineyards was divided into eight blocks and for four years each block, with the exception of the checks, received a different fertilizer treatment.

In securing the yields of grapes from the experimental plots in these two vineyards, it was noticeable that in most instances where potash was included in the fertilizer the yields were larger and the fruit clusters were more compact with less shattering at harvest time. The blocks receiving potash and superphosphate were consistent, year after year, in that the yields were larger and the quality higher than on the other plots.

The PK block, with the exception of one year, produced an average of 3.73 tons per acre during the six years' test, as compared with 2.83 tons from the other blocks in the Chase vineyard. In the Taylor vineyard the PK block averaged 2.96 tons per acre, whereas the other blocks yielded but 2.46 tons per acre. In each case there was a gain of one-half ton in favor of the PK blocks.

Increased production is desirable from the grower's standpoint, but im-

TABLE I—AVERAGE YIELDS FROM DIFFERENT TREATMENTS

	1924		1925		1926		3-Yr. Ave.	
Block-Treatment	Lbs. Per Vine	Tons Per Acre	Lbs. Per Vine	Tons Per Acre	Lbs. Per Vine	Tons Per Acre	Lbs. Per Vine	Tons Per Acre
No. 1 CHECK	12.19	3.69	4.33	1.31	12.33	3.73	9.62	2.91
No. 2 N	12.18	3.68	3.79	1.14	15.31	4.63	10.43	3.15
No. 3 NP	9.16	2.77	2.75	0.80	12.64	3.83	8.18	2.47
No. 4 CHECK	10.73	4.25	4.00	1.21	9.81	2.97	8.18	2.47
No. 5 NK	10.64	3.22	7.91	2.39	10.67	3.23	9.74	2.95
No. 6 NPK	11.10	3.36	6.38	1.93	13.44	4.06	10.31	3.12
No. 7 CHECK	10.15	3.07	6.04	1.83	10.58	3.20	8.92	2.70
No. 8 PK	9.65	2.92	10.85	3.28	16.54	5.00	12.35	3.73

Soil—well drained, gravelly loam.

Fertilizers applied at rate of 212 pounds nitrate of soda, 450 pounds superphosphate, and 80 pounds muriate of potash per acre.

proved quality is also an important factor in successful grape production. It is evident that potash plays an important part in both production and quality as the fruit on the potash blocks was larger and of better color, the clusters were more compact, and the sugar content was higher. The results of these first experiments prompted the establishing of other demonstrations in a few of the representative commercial vineyards in Kent county to study the effect of potash on growth of vine and quality of fruit.

TABLE II

B. B. Chase Vineyard—1927

Block	Treatment	Yield Per Vine	Yield Per Acre
No. 1	CHECK	9.32	2.82 tons
No. 2	N	9.30	2.81
No. 3	NP	11.58	3.50
No. 4	CHECK	9.57	2.89
No. 5	NK	11.83	3.58
No. 6	NPK	11.02	3.33
No. 7	CHECK	8.83	2.67
No. 8	PK	11.46	3.47

In 1928, arrangements were made with Messrs. Edward Todd, I. R. Jackson, R. F. Brown, B. B. Chase, Denny Pleasanton and Henry Ridgely to supply them with 100 pounds each of muriate of potash, to be applied to one acre in addition to their regular application of fertilizer. The soil conditions of the several vineyards were similar, a well-drained gravelly loam, but cultural practices and fertilizer practices differed. Animal manure was utilized whenever and wherever possible but because of scarcity and high price very little manure was used. Poultry manure is used by some growers as a source of nitrogen while others grow a cover crop of clover to supply organic matter and nitrogen.

One of the interesting facts brought out by these six demonstrations was that where the regular application of fertilizer ran from 10 per cent potash upward, at a rate of 600 pounds or more per acre, the additional potash may have showed but little increase in yield but there was a marked improvement in quality.

Aside from the differences in yields, the grapes produced on the potash blocks were more compact in the clusters (bunches), there was less shattering at harvest time, and the berries were larger with better color.

TABLE III—INCREASED YIELDS DUE TO POTASH

Grower	Regular Treatment	Yield Tons Per Acre	Yield with 100 lbs. KCl Additional
Edward Todd	800 lbs. 2-8-5 no manure or cover crop	2.85	3.82
I. R. Jackson	800 lbs. 2-8-10 no manure or cover crop	4.39	4.59
R. F. Brown	600 lbs. 2-8-8 no manure or cover crop	2.22	2.43
B. B. Chase	600 lbs. 3-11-11 light manure, no cover crop	3.62	3.71
Denny Pleasanton	600 lbs. 0-12-5 no cover crop—light appl. hen manure.	3.46	3.83
Henry Ridgely	250 lbs. superphosphate 250 lbs. muriate of potash no manure or cover crop.	2.45	2.45

A section of the superphosphate and muriate of potash block in the vineyard of B. B. Chase, Wyoming, Delaware. This block has produced an average of 3.73 tons of Concord grapes per acre for the past six years as compared to an average yield of 2.83 tons per acre from the other fertilization blocks in the same vineyard.

These factors are regarded by growers as being of most importance in the production of a profitable crop of grapes. As practically all of the grapes from this section are sold for table use and juice purposes, it is also essential that they be of high sugar content. *There is no doubt that the use of more potash is responsible for this higher quality product* being placed upon the market.

Arrangements were made to continue the work during 1929. The demonstrations for this year were conducted in the vineyards of Edward Todd and Denny Pleasanton. In each of these vineyards, blocks were arranged to receive extra amounts of potash so as to make the analysis range from 5 to 20 per cent potash. This was done in order to determine the most practical amount of potash that should be applied with a com-

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TABLE IV—POTASH INCREASED WEIGHT OF BERRIES
—1929—

Owner	Treatment	Lbs. Per Vine	Tons Per Acre	No. Bkts. Per Row	Wt. per Basket
Denny Pleastanton—Block 1	—600 lbs. 0-12-5	9.37	2.55	56	15.40 lbs.
Block 2	—600 lbs. 0-12-5 60 lbs. KC1	11.13	3.00	65	15.76 "
Block 3	—600 lbs. 0-12-5 120 lbs. KC1	9.14	2.49	54	15.60 "
Block 4	—600 lbs. 0-12-5 180 lbs. KC1	9.82	2.68	57	15.85 "

(Although Block 4 yielded fewer baskets than did Block 2, the weight per basket was greater showing that high potash increases weight of berries or bunches).

Red Raspberries

By Wm. L. Teutsch

Assistant County Agent Leader, Corvallis, Oregon

SUPERPHOSPHATE and potash applied to Cuthbert red raspberry plantings in Multnomah county, Oregon, resulted in yield increases amounting to .87 tons per acre, worth $69.60 at a fertilizer cost of $7.11 per acre. These figures were obtained by S. B. Hall, county agent, in a careful survey of 18 raspberry fields in that county.

The plantings selected for the study represented a wide variation in soil conditions and fertilizer practices. On some fields stable manure was used, on others sheep manure, but on nine fields superphosphate and potash were used to balance the fertilizer program and on nine other fields no superphosphate or potash was used. On an average the nine fields used superphosphate applied at the rate of 294 pounds per acre and potash at the rate of 111 pounds per acre. The average yield on the nine fields receiving superphosphate and potash was 3.12 tons per acre and on the nine fields receiving no application the average yield was 2.25 tons per acre.

"To determine the effect of phosphate and potash on quality after canning, samples of raspberries were taken from each of the 18 fields," Hall said. "These berries were canned in a uniform pack and put away for several months. The cans were then opened and scored by three canning experts from northwest canneries on color, texture, and size. The scoring was based on 100 points for texture, 100 points for color, and 100 points for size. The berries receiving potash and superphosphate in texture made an average score of 90.9 per cent and for color averaged 94.5 per cent compared with the average for the berries from fields receiving no potash or phosphate of 87 per cent for texture and 90 per cent for color. The advantage in favor of the fertilized plots was 3.9 per

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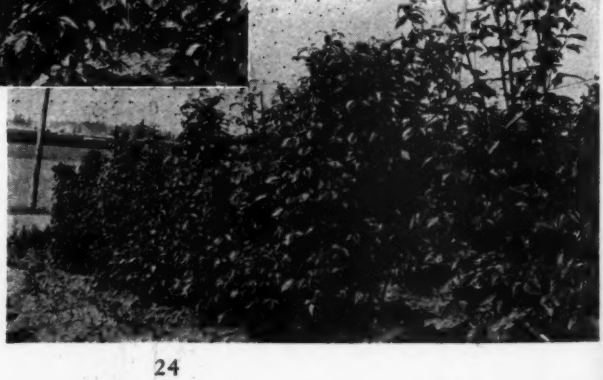

Above: Fertilizer practically eliminated winter injury suffered from severe winter conditions in 1928.

Left: The check plot, receiving no fertilizer, had winter injury to the extent of 50 to 60 per cent.

Turning under green manure crops ahead of planting vegetable crops is a good practice.

Fertilizers *for* Vegetables

By E. R. Lancashire

Extension Specialist, Ohio State University

Editor's Note: While the recommendations in this story are given for Ohio conditions, much of value can be obtained from them for growers in other sections of the country who are raising vegetables under similar conditions.

WHAT fertilizer shall I use, and how much, and in what manner shall I apply it? These are very common questions in the early spring months. In answering these inquiries in connection with the vegetable crops, it might be well to state that definite answers could hardly be expected considering the wide range of soils and conditions under which vegetables are grown.

There is possible, however, a sort of general recommendation from which or upon which the gardener can base his selection of fertilizers. The amount of fertilizer to be applied varies more or less with the section of the country and with the intensity of the program. Whether or not the fertilizer is applied broadcast or in the row is fairly well decided.

Successful vegetable growing necessitates attention to other soil factors as well as to the use of fertilizers. Assuming that the gardener has used manure and green-manure crops to the best possible advantage and assum-

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Central Wisconsin

This picture was taken August 31, 1929, on plots near Plainfield, Wisconsin. Note the difference in growth where fertilizer supplemented the manure.

THE old, sandy loam soil section of central Wisconsin is out to maintain its reputation as one of the most important potato producing areas in the United States. As far back as 1890, three counties, Portage, Waupaca, and Waushara, centrally located in the Badger State, were famed as strong growers and heavy shippers of late potatoes. It is to maintain this reputation and furnish profitable incomes to these light soil farmers who know potato production better than anything else, that is challenging the thought of some of the State's leading agriculturists.

Decrease in Yields

Wisconsin, ranking fourth among the States in potato acreage with about 260,000 acres or 7.2 per cent of the nation's total, still grows its commercial stock in rather restricted areas, of which the old, sandy loam section of the central portion of the State is of foremost importance. However, in 1927, this central district averaged only 80.5 bushels per acre as compared with an average of 107.6 in the northwest district and 105.6 bushels per acre in the northeast district which includes Langlade county.

Potato growers and potato buyers of central Wisconsin began freely expressing their growing concern for the status of the industry in their section. The relatively low production often appeared to be accompanied by inferior quality stock in respect to size, potato scab, and blight infestations which cause rot. With a farming population which was distinctly potato-minded and living on a soil ill-adapted to growing such heavy soil crops as corn, or heavy hay, the situation was becoming serious. The section had slowly developed a condition which prevented the successful growing of clover and alfalfa without first liming the soil. Thirty years ago or more, liming of the soil was unknown. Clover sometimes failed, but not regularly. Wheat was successfully grown there for years. All crops yielded relatively well. The soil, quite new then, supplied plant food abundantly.

Competition Arises

Just as this light soil could be easily worked and made to readily yield its meagre store of nitrogen, phosphorus, and potash to the planted crop so had it rapidly become depleted of these plant foods. It was no wonder that potato growing was on a down grade as far as yields and quality were

Stages a "Come-back"

Fertilizers help to keep this region prominent in the Badger potato game

By H. G. Frost

Portage, Wisconsin

concerned and that competition from other sections of the State was beginning to be keenly felt. Too, this competition was not only coming from other sections of Wisconsin but from neighboring States, like the Dakotas, Nebraska, Iowa, and Minnesota, which now ranks first of all the States in acreage, with 328,000 annually.

The sandy soil farmers began to look around them for a solution to their problem. Among other things they noted that the Langlade county district reported the use of 600 tons of potato fertilizer in 1926, 1,800 tons in 1927, and 2,800 tons in 1928, and they concluded that this decided upward trend in the use of fertilizer was not prompted by the desire for more exercise on the part of potato farmers in Langlade county. Accordingly, the best farmers in the sandy soil counties began following the lead of A. R. Albert, superintendent of the Wisconsin Experiment Station at Hancock in Waushara county and that of active, successful county agricultural agents, like H. R. Noble of Portage county, E. A. Jorgenson of Waushara, H. A. Murray of Adams, and James J. Lacey, who was then serving Green Lake county.

The sandy loam fields that had been hard to cover with good clover seedings were freely limed and then treated with one bag (125 pounds) of treble superphosphate and one bag (200 pounds) of muriate of potash per acre and a fair to good grain crop with an almost sure clover, alfalfa, or sweet clover seeding resulted. The equivalent of this fertilization, 325 pounds of 0-15-30, proved equally effective. Soil improvement along these lines has been accomplished upon acre after acre.

Wisconsin boasts of having 2,000,000 head of dairy cattle or 1/11 of the 22,000,000 head in the entire country.

A striking difference in yields continued the story told by the difference in vine growth between the two plots.

Good clover and alfalfa seedings encourage and support a barn full of cattle which in turn furnish barnyard manure. This matter of having a supply of manure is an important factor in maintaining soil fertility. Clover sod, top-dressed with an average of 10 tons of barnyard manure per acre, has been the practice of good potato farmers in the central, sandy soil section of Wisconsin for several years. These farmers began asking themselves if this combination was enough. Should this clover sod be top-dressed with manure supplemented by commercial fertilizer? The evidence strongly pointed to the answer, "Yes."

Start Tests

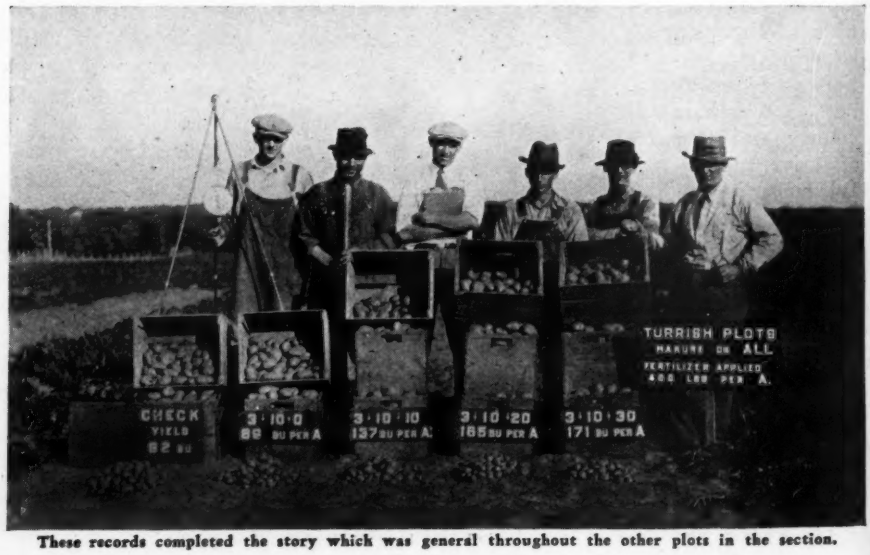
Consequently, this last season, nine tests were planned by the extension workers in these three counties of Portage, Waushara, and Waupaca, in cooperation with good farmers. Only fields of average fertility were chosen. The plots were laid out in a direction crosswise to the direction in which the manure spreader was driven when the field was top-dressed before the sod and manure were plowed down in the spring. This eliminated any danger of variation in plot yields due to streaked manure dressings.

In determining what fertilizer analyses were to be tested, the past findings of what had worked best for general soil improvement and clover growing in this region were kept in mind. Some cues also were taken from results of outstanding potato fertilization work by Professor F. L. Musbach of the Wisconsin Branch Experiment Station at Marshfield and the county agents of some of the counties lying to the north.

Four analyses were used, namely, 3-10-0, 3-10-10, 3-10-20, and 3-10-30. Whereas, an application of 800 to 900 pounds of fertilizer per acre is the rule for row application in the newer and heavier soils of northern Wisconsin, it was promptly decided that not more than 400 to 500 pounds per acre should be used in the row on these sandy loam soils of central Wisconsin because of their lower water-holding capacity and the danger of burning the crop.

But how was this 400-pound application of fertilizer to be applied in the row? Inquiry revealed that in Portage county, which grows upwards of 25,000 acres of potatoes annually,

(*Turn to page 55*)



These records completed the story which was general throughout the other plots in the section.

An overhead sawdust feed apparatus is being used here in packing Emperor grapes in lugs for storage.

What's Ahead?

"The optimist the doughnut sees,
The pessimist the hole."

¶ Number Five

By Frank George

THE last car of lettuce was being loaded from a 100-acre field in the Imperial valley. Three days later the entire field had been plowed, harrowed, bedded for cantaloupes, and the cantaloupes planted along one edge of each bed. The tractor had run 24 hours a day, the drivers working 8-hour shifts.

The scene changes to the celery fields of Florida. Spools of paper are being unrolled against the sides of the growing stalks—a blanching device. One man, with a mechanical harvester that cuts the stalks two inches below the surface of the ground, in a nearby field is keeping busy a gang of 30 laborers sorting and crating the crop.

Everywhere—from California to Florida, from Maine to Texas—there is feverish activity to catch the first flush of the market demand for fruits and vegetables; to satisfy the seemingly insatiable appetite for garden produce. Crop follows crop in the same fields where climatic and soil conditions permit; high yielding, quick yielding varieties are sought; competition is rife between industries and within industries. Plow, plant, cultivate, harvest, ship to market!

Within 10 years the area of 18 leading commercial truck crops has been increased more than 1,000,000 acres, or from 1,700,000 acres in 1920 to 2,778,000 acres in 1929—and the end is not yet. Although sudden large increases in acreage are to be discouraged, the long-time prospect is one of steadily increasing con-

(*Turn to page* 49)

Pasture Is Worth—?

By R. W. Donaldson

Extension Agronomist, Massachusetts Agricultural College

PASTURE plots top-dressed with complete fertilizers and lime showed an increased yield that was three times that of the unfertilized plots on 16 farms in Massachusetts where county agents conducted pasture demonstrations in 1929.

Last spring pasture top-dressing demonstrations were established on 53 farms for the purpose of finding the best treatment to restore run-out pasture sods. Records of yields for the first year were obtained on 16 of these farms.

Five plots were fenced off in each pasture, four for different treatments and one for a check. The following were the treatments and the average yields:

Fertilizer Per Acre	Yield Dry Grass Per Acre
Plot 1. Unfertilized ...	1196 lbs.
Plot 2. 600 lbs. superphosphate	1588 "
Plot 3. 600 lbs. phos. and 1 T. lime	1674 "
Plot 4. 600 lbs. phos. 200 lbs. potash and lime	1958 "
Plot 5. 1,000 lbs. 5-10-10 and 1 T. lime	3442 "

The results are what one would expect the first year. Treatments with superphosphate showed only slight gain. Where lime and potash were added, clover began to show up in many of the plots. Lime and minerals work slowly, but they improve soil conditions so that clover and better grasses gradually take the place of weeds and moss after several years. Where nitrogen was added to make a complete fertilizer, there was an immediate response and a stretch to the grass that did not require a microscope to detect it. Moreover the cows saw it, came, and ate it, reaching for it as far as they could reach under the fence.

Assuming a valuation of $20.00 per acre for rough pasture, a charge of $2.00 per year should cover investment, taxes, and fence repair. A ton of air-dry grass from the unfertilized plots costs, therefore, $3.34.

When lime or fertilizer is applied, these costs must be added. But the lime should be good for five years and the potash and superphosphate should last at least three years, so only the proportionate costs should be charged for any one year. Nitrogen, however, would be applied each year and charged in full against the crop. On this basis, a ton produced on the superphosphate pasture costs $5.30; on the superphosphate and lime, $9.80; on the superphosphate, lime, and potash, $10.00; while on the complete fertilizer and lime it costs $11.50.

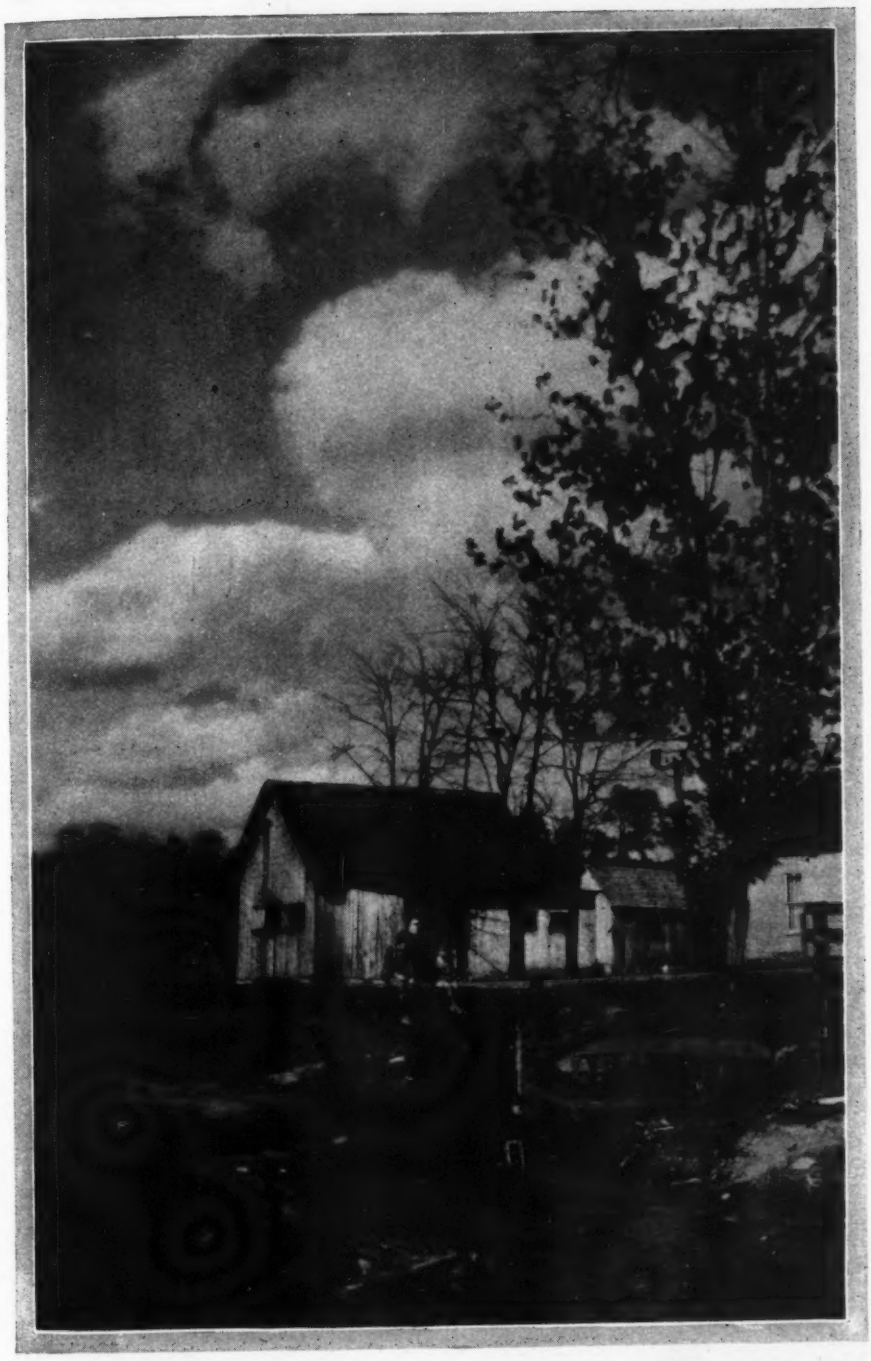
Real Effects Follow

It is obvious from the above figures that so far as the first year is concerned, the grass was cheapest where no fertilizer was applied. Grass from the superphosphate cost about half as much again, but where lime was added the costs were trebled over that from the unfertilized. The complete fertilizer and lime treatment was slightly the highest cost of all.

Does this mean that fertilizer treatments do not pay? Let's see!

Conclusions must not be drawn from the first year's results. As pre-

(*Turn to page* 47)



ENJOYING "SPRING FEVER"

PICTORIAL

Left: Here's a woodman who uses a hoe instead of an axe. The "windy" farmer has always had the reputation of being a poor worker, but in this case the more wind the more hoeing. He is a wooden weather-vane on a Connecticut farmer's porch railing.

Below: A familiar scene when early spring plowing takes place near the farm buildings. The chickens are having one of the best feeds of the year.

Right: Attempts are being made to evolve a new breed of chicken minus wings and toenails. The contrast between chickens of the same age, one with and one without wings, is shown here. Both specimens are perfectly healthy.

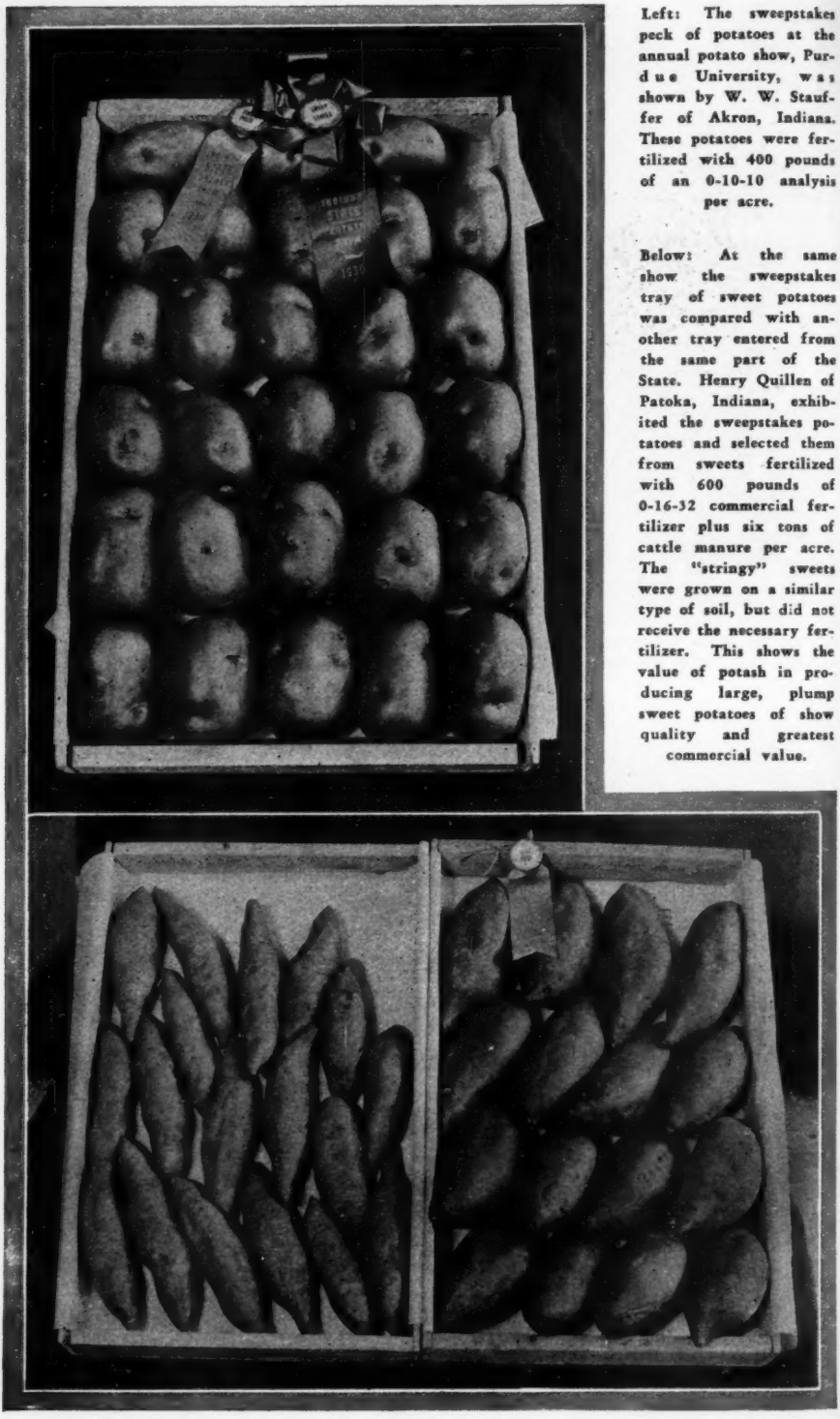
Below: A young farmer of the corn belt inspects his father's hogs. Judging from the looks, he will pronounce them about ready to market.

"This was one of the best and most interesting interviews that I ever had," says I. G. Kinghorn, Editor, Colorado Agricultural College. However, it didn't turn out successfully and he had to eat goose for Christmas.

Another typical sign of spring! Good shepherds dock all lambs to escape a docking in price by buyers when the lambs are ready to market.

This quartet makes up the entire list of Pulaski county, Indiana, agricultural agents during the past seventeen years. They are, left to right: Walter Kell, I. J. Mathews, H. J. Yarling, and O. H. McNary, in the order of their service.

A bit unsightly perhaps, but very practical! This farm wife raised a flock of ninety chicks in an old abandoned automobile.



Left: The sweepstakes peck of potatoes at the annual potato show, Purdue University, was shown by W. W. Stauffer of Akron, Indiana. These potatoes were fertilized with 400 pounds of an 0-10-10 analysis per acre.

Below: At the same show the sweepstakes tray of sweet potatoes was compared with another tray entered from the same part of the State. Henry Quillen of Patoka, Indiana, exhibited the sweepstakes potatoes and selected them from sweets fertilized with 600 pounds of 0-16-32 commercial fertilizer plus six tons of cattle manure per acre. The "stringy" sweets were grown on a similar type of soil, but did not receive the necessary fertilizer. This shows the value of potash in producing large, plump sweet potatoes of show quality and greatest commercial value.

The Editors Talk

The Proper Use of Potash Salts

It has sometimes been observed that potash used at or immediately after planting has not given any increase in yield. From this it has been too often presumed that potash is not necessary. But this question of the value of potash cannot be properly answered until we are more certain of the method and time of application. This is an important matter and deserves much more attention than it has received.

Some years ago Dr. F. W. Zerban made a preliminary study of the question of the time of application of potash salts to soils and crops in the southwestern States. The author gave some rather striking figures as a result of experiments on corn, cotton, and a few other crops. For instance, on corn he found that when muriate of potash was applied one week or less before planting, 62.5 per cent positive results were obtained. But when the same amount of potash was applied more than one week before planting, the percentage of positive results increased to 96. The percentage of increase in positive results due to early applications varied with the crop, soil, and form of potash used. The increase in positive results of experimental work from all forms of potash due to early applications was from 71.1 to 93.6 per cent.

Dr. Zerban went on to point out that in certain sections a side-dressing or top-dressing after the crop has been planted may be as desirable as applying potash ahead of planting. In this connection, as a general series of figures applicable to the soils of the southwestern States, the author states as follows regarding the different forms of application:

> "As a total average, we have 69.2 favorable results from early applications against 63.7 from side-dressing and 51.6 from applications within the danger period."

Again the same question has been discussed by Faas in "Ernaehrung der Pflanze" January 15, 1930. In this paper the author reports on experimental work in Germany. Demonstrations on winter wheat, oats, sugar beets, and potatoes were conducted and the potash was applied at different times, ahead of planting, at planting time, and after planting. The small grain demonstrations showed that the plots where potash had been applied early were more resistant to lodging. In each case the early applications gave the highest yield.

Forty-four demonstrations with different crops and times of applications have been made with the following results. Of eight demonstrations where the potash was applied before planting, 100 per cent gave a profitable increase in yield. Of twelve demonstrations where the potash was applied after planting, 50 per cent gave an increase in yield, while only 16 per cent gave an increase when the potash was applied at the time of planting. The author goes on to point out that the Neubauer test may indicate a potash deficiency and yet the potash demonstration conducted on that soil may not do so.

It is considered that this is often due to the wrong time of application. These figures show how careful one has to be in laying out experiments and demonstrations with potash and especially in the interpretation of the results.

If no attention is given to the time of application, one may be inclined to assume that the soils or crops in the experiment do not require potash, which too often is not the case.

Along with the larger subject of the time and method of applying all fertilizers, certainly the proper use of potash should be given a very prominent place in such a program of research and experimental work, if the information given the farmer is to be of sound and practical value.

The How and Why of Farming

Show me a man in big business who, while keeping his eye on the main issues, does not overlook details, and I will show you a successful executive. Show me a farmer who carefully selects his planting seed; terraces, breaks and cultivates his land so that no gullies run across his fields; conducts fertilizer tests as to quantity and ratios of elements involved in maximum, economic crop production; tests labor saving devices; and looks carefully after the various other items involved in farm management; and I will show you a farmer who makes money farming.

According to Paul Burson, winner of the Georgia cotton contest in 1929, the three most important points in growing cotton are, "good seed, proper fertilization, and boll-weevil control." He has been selecting his seed for twenty years and he knows the how and why of seed selection.

The average Georgia farmer spends less than $5.00 per acre in fertilizing cotton, while Mr. Burson spends $20.00. Again, the average farmer uses a fertilizer with a 3-1-1 ratio as to phosphoric acid, nitrogen, and potash while Mr. Burson uses a 10-7-9 ratio, and Mr. Burson knows why.

Mr. Burson knows Mr. Boll-weevil's habits and life history, and whips him at his own game. - The Burson record is: in 1927—120 bales on 125 acres; in 1928—134 bales on 125 acres; in 1929—161 bales on 135 acres. As winner of the Georgia 1929 contest, Mr. Burson produced 5,283 pounds of lint on 5 acres, almost 6 times the State average.

Cullum Medal Awarded Dr. C. F. Marbut

Everybody who knows Dr. Marbut will accord most heartily with the honor that has recently been conferred upon him for his distinguished services in geographic research. His untiring work and unfailing assistance in the organization of the recent International Congress of Soil Science held in Washington in 1927 will long be remembered by everybody who attended the Congress.

As Chief of the Soil Survey, Bureau of Chemistry and Soils, U. S. Department of Agriculture, Dr. C. F. Marbut has been awarded the Cullum Geographical Medal, conferred by The American Geographical Society in recognition of services of special distinction in the field of exploration and geographic research. The presentation was made in New York City February 25

at a banquet of the society. Major General George W. Cullum, president of The American Geographical Society from 1877 until his death in 1892, established the award which bears his name. The first award was in 1896, to Admiral Robert E. Peary, discoverer of the North Pole. Among those to receive this award in the past have been Peary, Fridtjof Nansen, Sir John Murray, Robert F. Scott, and Sir E. H. Shackleton.

Doctor Marbut's extensive studies and classification of the soils of Europe, Africa, South America, and North America have furnished an important contribution to the soil geography of the world. There is probably no man, says Dr. A. F. Woods, Director of Scientific Work of the Department of Agriculture, who has a wider or more intimate knowledge of the soil types of so many different countries.

In 1899, while a professor at the University of Missouri, Doctor Marbut spent a year examining and classifying soils in every country of western Europe except Spain. On a later expedition he made an extensive study of the soils of southeastern Europe. In 1918, at the instigation of the technical advisors of the American Commission to Negotiate Peace, he directed the classification of the soils of Africa. The result of this study was the publication of his scientific description and classification of African soils called "Vegetation and Soils of Africa" written in collaboration with Dr. H. F. Shantz of the Bureau of Plant Industry and published by The American Geographical Society in 1923.

For many years Doctor Marbut has had supervision of the soil survey work of the U. S. Department of Agriculture, in which more than 880,000,000 acres, approximately half the agricultural land of the United States, have been mapped and described. As a guide to farm practice, this inventory of soil resources is becoming established as the scientific foundation of this country's program of agriculture.

Doctor Marbut is chairman of the International Commission on Genesis, Classification, Morphology, and Mapping of Soils. He presided at the sessions of that commission held last May in the Free City of Danzig.

As chairman of the subcommission on mapping the soils of the Americas, Doctor Marbut recently made a study of the soils of South America, in addition to his lifelong study of the soils of the United States, upon which he will report at the triennial meeting of The International Soil Congress to be held in Leningrad, Union of Socialist Soviet Republics, in July this year.

On the Cullum medal received by Doctor Marbut are inscribed the words, "For his geographical work on the soil, 'the foothold of all things.' "

Fertilizing Tree Fruits

For a long time nitrogen has been recommended as the most important and in many cases the sole fertilizer required for tree fruits. Within the last few years from various sources, there have appeared signs of dissatisfaction with this program. Among others, the buyers of fruit have not always been satisfied, saying that the fruit produced by the nitrogen program was not of a good quality. In many cases it is reported that buyers have reduced the price, if it were known that the nitrate program had been followed too exclusively.

This discontent naturally led to further research and experimental work on the part of many horticulturists. The results of some of this work were discussed at the recent meeting of the American Society of Horticultural Science, which was held as a part of the general program of the Society for the Advancement of Science, in Des Moines, Iowa. The experiments reported are much more exhaustive than they were formerly. Various methods and materials are being critically examined under the best orchard conditions that it is possible to obtain. One paper showed definitely that phosphorus and potash in addition to nitrogen gave excellent results on apples. The general tenor of the other papers was that under the conditions of the experiments no definite result could be shown from phosphates or potash.

Therefore, at the moment the outlook is not very hopeful that those who are not satisfied with the nitrogen program will be reconciled to the expert advice of the horticulturists.

Undoubtedly much of the so-called damage or bad effect of nitrogen is due to an unbalanced fertility program and possibly the use of excessive amounts of nitrogen or under conditions that have not been recommended in the horticultural program. On the other hand, experimental work with tree fruits is difficult. Under many conditions it takes a long time for the fertilizers to influence tree growth and the method and time of application may not be satisfactory, so that on the whole it is probable that the experimental technique may yet have to be refined or modified before accurate results will be obtained.

Certainly, however, the nitrogen program does not seem to stay put. Neither, by any means, does it seem to satisfy everybody. Undoubtedly the best attitude on this question was expressed by a speaker at a recent horticultural meeting who said in effect that our present knowledge on nitrogen and tree fruits is the best we have, but it is far from final or complete, and that much more work needs to be done before practical and satisfactory answers can be given to all the problems involved in fertilizing tree fruits.

Fertilizers "Go West"

New Mexico now has a commercial fertilizer law. It was passed by the Ninth Regular Session of the Legislature of the State of New Mexico in 1929. Until that date New Mexico had been without any form of regulation with respect to fertilizers. It is pointed out that agricultural conditions are changing and with it the use of fertilizers. The law has been patterned after similar laws found successful in other States.

The law requires information regarding the kind and maximum percentage of substances used as fillers, also a guaranty that the fertilizer contains no horn, hoof, hair, feathers, or other inert nitrogenous matter.

The law also requires that each manufacturer, importer, jobber, firm, association, or corporation shall notify the fertilizer control office within twenty-four hours after making any shipment of fertilizer. The date, amount, destination, etc., of each shipment into or within the State must be reported.

Another feature is that all materials for which any claim of inoculation is made must be registered and reported. The registration must show the purpose of the organisms present and other information.

Thus it is very significant of the change that has taken place in our national agriculture that States considered far outside the old fertilizer territory are now enacting fertilizer laws.

Alfalfa

¶ *Sixteenth in this series*

By Walter H. Ebling

Agricultural Statistician, Wisconsin

ALFALFA is probably a native of of Central Asia. It was brought to America about the middle of the last century and has since spread to all States. It is probably the best known of our tame hay crops, and efforts are now being made to grow it practically everywhere.

Of the tame hays it is not only the most important and valuable from the standpoint of total production, but it also excels in quality. Its feeding value for practically all classes of livestock is more and more being recognized, and this together with its high production per acre accounts for the great efforts which are being made to grow it in practically all States.

A Western Crop

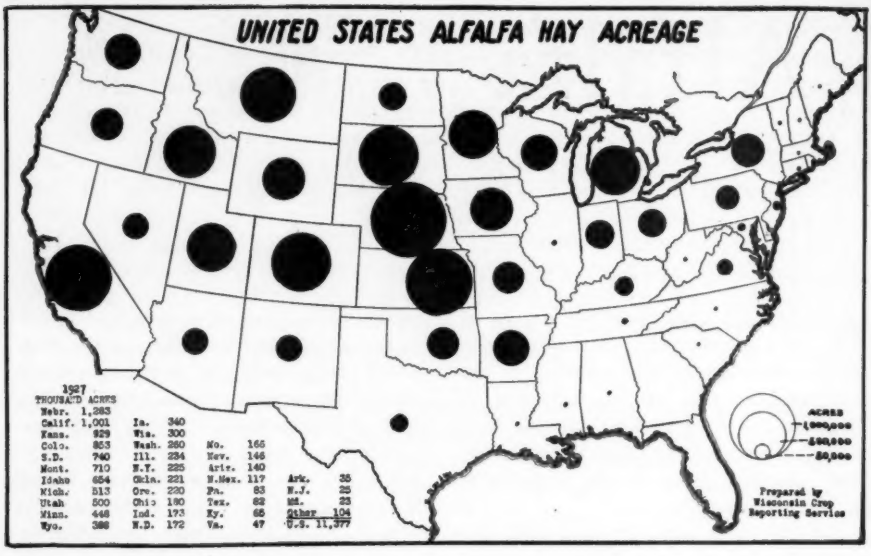
Geographically, alfalfa is still the great hay crop of the West. It finds its most favorable conditions in the western States where the soils are not acid and where there is relatively little rainfall during the summer. In spite of the marked efforts which have been made to introduce it on a large scale in the dairy and livestock regions of the East where a hay crop of this type is so much in demand, 83 per cent of the United States alfalfa acreage was still west of the Mississippi River in 1927.

A good hay plant must be suitable both from the standpoint of consumption and production—alfalfa excels in both. According to the United States Department of Agriculture more animal units are supported by alfalfa hay than by any other hay crop in the country. In fact, in rank as a livestock feed plant, alfalfa is exceeded only by corn and oats. Experiments reported by Kansas show that when the crop is cut in the one-tenth bloom stage it contains over 18 per cent protein; when cut in the one-half bloom stage it contains over 17 per cent; and even in the full bloom stage it contains over 14 per cent of protein. This unusual hay feeding value makes alfalfa a preferred hay for most classes of livestock. In its chopped form it is even fed to hogs and poultry.

As crop rotations go, those involving alfalfa run for unusually long periods. In the more favorable conditions found particularly in the West, fields have frequently been cut as long as 15 or 20 years. In the more humid sections it usually does not last nearly that long. While it grows on nearly all types of soil, it is usually found that in humid sections it is less vigorous and makes fewer cuttings per year. In addition, it suffers more from disease and yields to weeds more readily in regions of heavier summer rainfall, with the result that fields in the eastern part of the United States usually are plowed up much earlier than fields of the same planting date in the drier western States.

1929 a Good Year

In 1929 the estimated production of alfalfa hay in the United States was nearly 30,000,000 tons, which is approximately 30 per cent of the tame hay production for the country. The large production is in a considerable measure the result of high yields per acre, the average per acre yield for alfalfa last year being 2.59 tons per



acre as compared with 1.78 for clover and 1.34 for timothy. It must be remembered further that 1929 was an usually favorable year for clovers in the more important clover growing States. In total acreage Nebraska, California, Kansas, Colorado, and the Dakotas are usually the leading ones. In the production of seed, which is an important source of income for many alfalfa growers, Utah leads followed by Arizona, Idaho, Nebraska, and Colorado. The demand for American grown seed is increasing and prices have been well maintained. It is found more and more that imported seeds, especially those from countries of milder climates, are less satisfactory under American conditions than northern home-grown seeds.

Cultural Practices Vary

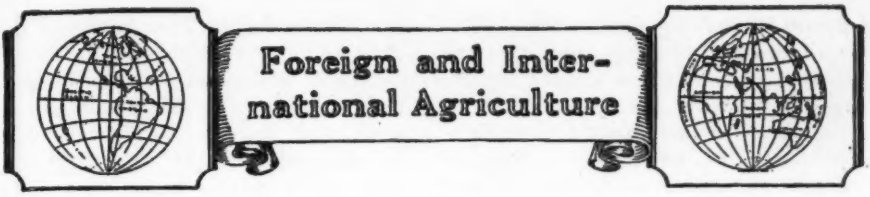
From the standpoint of cultural practices, there is considerable variation in the handling of alfalfa in the different sections. In the main, however, the seeding is done broadcast usually with a nurse crop. In the Midwestern States barley serves especially well for this purpose since it is harvested early and does not lodge or shade the ground excessively. Like most hay crops, alfalfa is usually harvested for the first time the year after seeding.

In cutting the crop different practices are followed. Probably one of the most important methods now used in the West is stacking the hay by the use of a stacker and buck rake. This method is probably the least expensive from the standpoint of man and horse labor. In the more humid sections raking the dried hay into windrows is common. Piling of the hay into small hay cocks for curing is also customary, but probably less so than in the past. A very satisfactory method of handling alfalfa on most dairy farms seems to be that of raking it into windrows by means of a side-delivery rake and loading it with a hay loader and thence hauling it to the barns. Because of the leafy nature of the crop, the matter of handling it is rather delicate since the loss of leaves reduces materially the value of the hay. Artificial drying experiments with alfalfa have been conducted with some success.

Quick Work

Lady—"Is this milk fresh?"

Milkman—" 'Arf an hour ago, madam, it was grass."



Apple Anthracnose

By E. R. Bewell, B.S.A.

New Westminster, B. C.

DURING 1928, I carried on an experiment at Courtenay, British Columbia, to see what effect the use of sulphate of potash had on controlling anthracnose of apple trees. I had been informed by a reliable authority that a good supply of available potash in the soil was necessary in order to produce a mature wood that would be resistant to anthracnose and increase the vigor of the tree so that there would be a yearly crop of apples, instead of a crop every second year which is the usual thing here in the coast area of British Columbia.

I wrote a report of this experiment about a year ago and it was published in the March issue of BETTER CROPS WITH PLANT FOOD. I was criticized for writing the report on only one year's work, but the results I got were better than I expected, and supported the lack of potash idea. The most important part of it was that the results agreed with the information I had received on the subject, and this year's work shows still more that the potash treatment is a success.

The common method of controlling anthracnose here is by pruning out badly diseased branches and spraying the tree with a spray recommended for the purpose.

I continued the experiment during 1929, and the results were very satisfactory. I had the man looking after the orchard apply more fertilizer to the tree. Three pounds of sulphate of potash as well as three pounds of superphosphate of lime were applied in September, 1928, and two pounds of each were applied in March, 1929, as well.

Only part of the dead wood was removed in 1928 so the tree was given a heavy pruning in the spring of 1929 and all dead wood removed. The District Horticulturist for this area visited the orchard and recommended a spraying, which was given.

The tree came into bloom and out in leaf quite normally this past season, and I was advised by C. W. Leedam that the tree produced a fairly good crop of apples again this year. This was somewhat of a surprise, as most fruit trees in the coast area of British Columbia only produce a crop every second year. They seem to need a year's rest after producing a crop.

Need Yearly Applications

I left Courtenay last May so was not able to watch the apple tree throughout the summer, but I visited the orchard the end of August and inspected the tree. I was agreeably surprised to find it in such a healthy condition, showing a strong, healthy growth of new wood, with dark green leaves and every evidence of maturing properly. There was practically no new infection of anthracnose to be seen. The old scars were healed up or were healing over.

An application of fertilizer, high in

potash, should be given yearly. This with proper pruning and spraying should give the tree a chance to produce good crops for several years.

Our soils in the coast area of British Columbia are usually lacking in potash, phosphoric acid, and lime, and most of the highland soils are low in nitrogen as well. The peaty soils and mucks are rich in nitrogen but lack the other elements. So it is only reasonable to expect a soft growth that is not hardy and which is more subject to disease. Where there is plenty of the essential elements, we naturally expect to get a more mature wood to have the trees in a more vigorous condition, and to get more uniform crops. I might add that we have a long growing season here, growth starting in April, sometimes in March, and brought almost to a standstill during the summer which is usually quite warm and dry. The fall rains start growth again, making practically two growing seasons in a year. This second growth continues late in the fall and many of our fruit trees have green leaves on them in November, and sometimes into December.

Prevents Winter-killing

We find these long growing seasons bring our fruit trees into bearing much earlier than in areas of shorter growing seasons where they have cold winters with plenty of snow. Our winters, that is periods of cold weather with snow, in the coast area are short. Most of our winter season is rainy weather. We often get a cold spell in December with or without snow, or it may come in January or February. These cold spells last from a week to a month or five weeks and vary in severeness, but as soon as a stormy period springs up with a southeast wind, we get rain which is most welcome, and the snow all disappears.

We also have trouble with winter-killing, especially after a nice fall with plenty of moisture which promotes a strong second growth. This good growing weather sometimes continues into November. This happened in 1924 and a severe cold spell set in, in December when temperatures dropped very suddenly, zero being registered at some coast points. As the trees had not become dormant yet, they suffered from winter-killing, especially where they were exposed to a strong north wind, but where they were not exposed to the wind the winter-killing was not so severe.

Last winter, the weather was quite mild up to the end of January. We had some snow during November, 1928, which stayed about two weeks. This stopped growth but was not severe winter weather. Rains about the first of December removed all the snow and the weather was fairly mild up to January 26, 1929, when it turned real cold and we had some real severe winter weather which lasted through most of February. For about one week we had zero weather, the temperature dropping to as low as three and five degrees below zero. This was the coldest weather experienced here for many years, but it had no bad effects on the tree treated with potash, showing that the wood was more mature than it had been previously and was able to stand this extremely cold weather, as well as being more resistant to anthracnose.

I am satisfied that the use of fertilizers high in potash helps produce a mature wood that can stand the cold spells we get during our winters as well as assists in controlling diseases. Our soils are all acid and need lime, which would make the fertilizers more effective, and by adding all elements to our fertilizers, I feel sure we can improve the quality and flavor of our fruits. They do not have the flavor of fruits grown in the colder fruit growing sections, as their soils are not subject to leaching since their rainfall is light. The heavy winter rainfall at the coast is constantly depleting the soil, and steps must be taken to replace what is lost in this way.

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture and the State Experiment Stations relating to Soils, Fertilizers, Economics, Crops, Crop Diseases, and Insects. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizers

Profitable returns on the investment in commercial fertilizers can only be derived if farmers use them properly. Realizing this, many of our State experiment stations are finding it desirable to bring together the results of their experiments in the form of special bulletins, wherein the proper analysis and rate of application per acre are given for each important crop for both mineral and muck soils. Circular 53, "Fertilizer Recommendations for 1930," by Messrs. M. M. McCool, G. M. Grantham, and P. M. Harmer of the Michigan State College, is such a publication and of particular interest for the discussion concerning the economic use of fertilizer in profitable crop production.

In this same connection, the North Carolina Experiment Station has just published fertilizer recommendations for eight important soil regions of the State in eight separate circulars (Agronomy Information Circulars No. 34, 35, 36, 37, 38, 39, 40, 41) by C. B. Williams, H. B. Mann, and A. S. Cline.

These Michigan and North Carolina recommendations represent two distinct methods for treating the subject of fertilizer recommendations. Both of them serve a very useful purpose.

"Twentieth Biennial Report of the Department of Agriculture," Tallahassee, Fla., 1927 *and* 1928.

"Individual Samples of Commercial Fertilizers," Ga. Dept. of Agr., Atlanta, Ga., Serial 114, 1929.

"Commercial Fertilizers," Ga. Dept. of Agr., Atlanta, Ga., Serial 115, 1929.

"Official Inspections," Agr. Exp. Sta., Orono, Me., No. 133, *October,* 1929.

"Commercial Fertilizers," State Fertilizer Inspection Service, College Park, Md., No. 135, *January,* 1930.

"Michigan Fertilizer Bulletin," State Dept. of Agr., Bul. No. 58, 1929 *Spring Report.*

"Fertilizers, What They Are and How to Use Them," Agr. Exp. Sta., New Brunswick, N. J., Bul. 75, *December,* 1929, *H. R. Cox.*

"Analyses of Commercial Fertilizers, Fertilizer Supplies, and Home Mixtures for 1929," *Agr. Exp. Sta., New Brunswick, N. J., Bul.* 490, *October,* 1929, *Charles S. Cathcart.*

"Official Report on Feed Stuffs, Commercial Fertilizers, and Agricultural Lime and Limestones," Dept. of Agr., Columbus, Ohio, 1929.

Crops

Very compact information on red raspberry culture is presented by the University of New Hampshire Extension Service in a new Extension Circular 103. The authors, L. P. Latimer and H. A. Rollins, in the four-page pamphlet briefly discuss the chief factors in success with this small fruit, the quality of which plays such an important part in the demand. Small-fruit growers will find this circular a very interesting reference.

"Results of Cotton Variety Tests 1926-1929," *Agr. Exp. Sta., Auburn, Ala., Cir.* 55, *Jan.,* 1930, *H. B. Tisdale and J. T. Williamson.*

"Forty-First Annual Report Fiscal Year Ending June 30, 1929," *Agr. Exp. Sta., Fayetteville, Ark., Bul.* 246, *Dec.,* 1929.

"Monthly Bulletin of the Department of Agriculture, State of California," Sacramento, Calif., Vol. XIX, No. 1, *January,* 1930.

"American Potato Journal," The Potato Association of America, East Lansing, Michigan, Vol. VII, No. 1, *January,* 1930.

"Annual Legumes for Hay and Green Feed,"

Univ. of N. H. Ext. Serv., Durham, N. H., Press Bul. 157, May, 1929, Ford S. Prince.

"The Bimonthly Bulletin," Ohio Agr. Exp. Sta., Wooster, Ohio, No. 142, Jan.-Feb., 1930.

"The Climate of Ohio," Ohio Agr. Exp. Sta., Wooster, Ohio, Bul. 445, December, 1929, Wm. H. Alexander and Chas. A. Patton.

"Plant Forest Trees on Idle Land," Agr. Exp. Sta., State College, Pa., Cir. 130, Nov., 1929.

"Virginia Department of Agriculture and Immigration," Dept. of Agr. and Imm., Richmond, Va., Bul. 265, Jan., 1930.

"Training General Educational Administrators in Responsibilities for Vocational Education," Federal Board for Vocational Education, Washington, D. C., Bul. 140, Dec., 1929.

Economics

The cooperative marketing of agricultural products has increased rapidly since the war. Some cooperatives have been successful while many have failed. In order for progress to be made, it is advisable to profit by the experience and lessons that have been learned in the past. A new publication, Bulletin 245, "The Status of Cooperative Cotton Marketing in Arkansas," by B. M. Gile, is a study of the cooperative cotton marketing in Arkansas and what has been accomplished in the past. It, furthermore, is a study of the attitude of cotton growers toward cooperative marketing. With the present emphasis which is being placed on the cooperative marketing by the Federal government, studies such as these are timely and useful.

"Prices of North Dakota Farm Products," Agr. Exp. Sta., Fargo, N. D., Bul. 232, December, 1929, O. M. Fuller and Rex E. Willard.

"The Agricultural Outlook for 1920," U. S. D. A., Washington, D. C., Misc., Pub. 73, February, 1930.

Diseases

"Footrot of Citrus Trees and Its Treatment," Agr. Exp. Sta., Gainesville, Fla., Press Bul. 417, Sept., 1929, Arthur S. Rhoads.

"The Rusts of Pennsylvania," Agr. Exp. Sta., State College, Pa., Bul. 239, May, 1929, F. D. Kern, H. W. Thurston, Jr., C. R. Orton, and J. F. Adams

"Gummosis and Psorosis of Citrus Trees," Agr. Exp. Sta., Gainesville, Fla., Press Bul. 418, Sept., 1929, Arthur S. Rhoades.

"Treatment of Gummosis and Psorosis of Citrus Trees," Agr. Exp. Sta., Gainesville, Fla., Press Bul. 419, Sept., 1929, Arthur S. Rhoads.

"Disinfectant Pastes and Washes for Treating Bark Diseases of Citrus Trees," Agr. Exp. Sta., Gainesville, Fla., Press Bul. 420, Sept., 1929, Arthur S. Rhodes.

"The Cause and Control of Melanose," Agr. Exp. Sta., Gainesville, Fla., Press Bul. 421, Dec., 1929, Arthur S. Rhodes.

"The Cause and Control of Citrus Scab," Agr. Exp. Sta., Gainesville, Fla., Press Bul. 422, Dec., 1929, Arthur S. Rhoads.

Insects

"Biology and Control of the Southern Corn Rootworm," Agr. Exp. Sta., Auburn, Ala., Bul. 230, Nov., 1929, F. S. Arant.

"Cryolite and Barium Fluosilicate: Their Use As Insecticides," Agr. Exp. Sta., Knoxville, Tenn., Bul. 140, Nov., 1929, S. Marcovitch and W. W. Stanley.

Vegetable Growing

One of the most interesting and practical text-books on vegetable growing that has found its way to our library during the past few years is "Vegetable Growing" by James Edward Knott, Ph. D., Research Assistant Professor of Vegetable Gardening, Cornell University.

The contents have been recorded in a natural progression beginning with the simple question of producing vegetables for man and other animals. The author carries the student through problems of light, heat, moisture, and food supplies as affecting growing plants. A discussion of the condition, classification, fertilization, and cultivation of the soils is comprehensive and full of interest.

Chapters deal successively with production of seed and seedlings, the control of diseases and insects, and the growing and maturing of the numerous varieties of plants which constitute our vegetables.

Many useful and practical methods of preparation and treatment of a variety of soils, to meet the needs of the

particular crop in question, are clearly and succinctly set forth.

The application of manures and fertilizers, as indicated by the needs of the different crops, having regard for the natural supply of the elements already contained in the soil, is ably discussed.

Harvesting, preparing for market, and marketing the many vegetables that go to make up our daily food are explained in separate chapters.

This volume of orderly contents, attractive illustrations, and alphabetical index, as a textbook for students and a reference book for practical gardeners, should prove a valuable contribution to our horticultural literature.

Row Application for Wheat

APPLICATION of commercial fertilizer in the row at time of seeding wheat increased the yield 6.8 bushels per acre over the yield obtained when the same amount of fertilizer was broadcast over the field, according to F. L. Duley, Professor of Soils at the Kansas State Agricultural College. The result was obtained during a recent study of the comparative value of various methods of applying fertilizer to wheat at the Kansas Agricultural Experiment Station.

The broadcast method of applying fertilizer is the one that has been most commonly used in experimental work in Kansas because it is the most convenient method when handling small test plots, but not, as the above results show, the most profitable method of using fertilizer. To apply fertilizer in the row a special attachment must be used on the drill.

Study of the new method has not been extensive enough to determine conclusively its value under varying soil and climatic conditions within the State, Professor Duley explains. However, the method has been used for many years in the southeastern counties where the application of fertilizer to wheat land is a well-established practice.—*F. E. Charles, Kansas Agricultural College.*

Pasture Is Worth—?

(*From page* 30)

viously noted, the real effects of the lime and fertilizer treatment in building up the soil have scarcely begun. We shall expect different results three years from now. Furthermore, with such an unusually dry season and with a rainfall during June and July that was less than one-quarter the normal and only one-eighth of what fell a year ago, full results could not be expected. But, the real point is—"*What Is Pasture Feed Worth?*" For the farmer who needs more pasture feed, what is it worth in terms of barn feeding costs?

Young pasture grass that has been fertilized averages 15 to 20 per cent protein on a dry weight basis. It is equal to alfalfa hay as a feed which costs $25.00 to $35.00 per ton. Good pasture is rich enough to replace at least half of the $50.00 grain that otherwise has to be fed. Gus Peterson of Bridgewater, Massachusetts, maintained 60 cows during June and July this past season on pasture feed without feeding an ounce of grain or roughage feed, and he uses a complete fertilizer as top-dressing.

The farmer who has enough pasture feed may not realize how fortunate he is. Possibly such a farmer needs only a cheap treatment to maintain it. But the farmer, who really needs pasture feed that is worth maybe at least $25.00 to $30.00 per ton in place of barn feeding costs, can well afford

even the most expensive fertilizer treatment if it will give him three times the amount of grazing at a cost of between one-third to one-half what his barn feeding actually costs.

Note—A number of Massachusetts farmers are planning to apply 500 to 800 pounds of a 5-8-7 per acre on their poorer sods or an 8-6-6 on their better sods. From 500 to 1,000 pounds of lime per acre would unquestionably be profitable in cases where an application of one ton would add too greatly to the initial cost.

"Red" Raspberries

(*From page* 24)

cent so far as texture was concerned and 4.5 per cent on color."

Another interesting demonstration which Mr. Hall established in his county three years ago showed definitely that the use of superphosphate produces winter hardiness in Cuthbert red raspberries. Three years ago on the farm of Ray Reitzma a one-half acre plot of red raspberries was given an application of superphosphate at the rate of 1,000 pounds per acre. For two years this demonstration showed very slight results. During the 1929 crop season preceded by severe winter conditions, the results were marked. Since the application of the superphosphate the whole field has had the same treatment receiving a light annual application of stable manure and 100 pounds of superphosphate per acre and 100 pounds of potash per acre.

The winter injury on the plot which received the 1,000-pound application of superphosphate was but 5 to 10 per cent, while on the half acre immediately adjoining 60 per cent of the canes were injured by freezing. From this demonstration Mr. Hall believes that superphosphate has a definite effect upon the winter hardiness of raspberry plants.

Several years ago another Oregon county agent observed in a demonstration plot in Douglas county following a severe winter that broccoli plants growing on ground which received applications of superphosphate showed much greater resistance to cold temperatures than did broccoli on ground where no superphosphate was used.

Profits from Fertilized Pastures

(*From page* 13)

turing earlier to prevent too rank and woody a growth which the cattle did not like.

A very important benefit from fertilizing pasture and one that does not appear in the yield figures is how much better and closer cattle will eat fertilized pasture than they will the more woody and less palatable unfertilized grass. The closer grazing helps to keep down weeds and coarse growth and helps to increase the carrying capacity of the pasture.

RECOMMENDATIONS

1. Select the best pasture areas on which to begin fertilizing.
2. Top-dress with lime (on acid soils) and fertilizer carrying potash and phosphoric acid to insure suitable soil conditions and a good sod.
3. Top-dress with nitrogen fertilizer for immediate results and over as large an area as the feed can be used to good advantage.
4. Top-dress with nitrogen fertilizer when 10 or more additional days of pasture are desired at the be-

ginning of the pasture season.

5. Top-dress average pastures with not more than 30 pounds of nitrogen (200 pounds nitrate of soda or calcium nitrate or 150 pounds of ammonium sulphate) in early spring. For greater benefit from nitrogen make one or more midsummer treatments.

6. Do not fertilize large areas of poor pasture or pastures on light sandy soils or pastures likely to dry out early in the season until small trials show that it will pay.

7. Top-dress loams and sandy loam pastures with sufficient fertilizer carrying phosphoric acid and potash to last more than one season.

8. Top-dress heavy clay and clay loam pastures with superphosphate only or with fertilizer carrying phosphoric acid and nitrogen only until test trials show that potash will pay.

9. Wherever possible fence the pasture into three or more fields so that they can be pastured in rotation allowing each field from one to two weeks rest between grazings. The cows are then in fresh feed all of the time. They travel over much less ground to get filled up and graze the pasture more evenly.

Note—The writer wishes to take this opportunity of thanking the Rutland county bankers who supplied the money needed to finance these pasture tests. The work was conducted by the County Farm Bureau, County Agent T. D. Cook of the state extension service with the cooperation of the U. S. Department of Agriculture and the county farmers.

What's Ahead

(*From page* 29)

sumer demand. The lettuce area, for example, has increased from approximately 32,000 acres to more than 141,000 acres in the last 10 years; yet the Federal Bureau of Agricultural Economics, in its 1930 Outlook Report, declared that "the pronounced increase in the demand for lettuce continued in 1929 and there is as yet no evidence that the peak of demand has been reached."

Eyes are centering on the eastern cotton belt as the scene of great development in the truck crop industries in the next 10 years. The factors that will produce this change are the unprofitableness of cotton production in competition with the large scale, low cost production methods of the West; the increasing industrialization of the South with its consequent growth of cities, and the ever-increasing winter tourist travel with its corresponding demand for farm products. The continued growth of industrial cities in the North is also furnishing an expanding market for early fruits and vegetables.

Ten years ago the production of carrots was regarded by the Department of Agriculture as of too little importance for the compilation of production statistics. Peppers were in the same category. Today they occupy a place in the list of 18 leading commercial truck crops, the 1929 area of carrots being reported at 30,570 acres, and of peppers for market, 17,810 acres. The once despised tomato, or "love apple," which was considered poisonous, and at sight of which women are said to have fainted, now occupies 149,000 acres for market and 285,000 acres for manufacture.

Improved transportation and refrigeration are commonly accepted as the chief reason for the expansion which has taken place in the fruit and vegetable industry in recent years. These have practically doubled the market outlet for fresh produce by making supplies available throughout the winter on consuming markets. This situation and the current developments

in electrical refrigeration with consequent speeding up of transportation are causing the canning industry some sleepless nights. To combat them, considerable experimentation is being made in the canning of fresh fruits and vegetables by the "frozen pack" method.

A railroad entering Chicago has developed plans for an overhead icing system in Chicago which will make it possible to ice 700 cars without moving any of them. Allowing 45 feet to a car, this means almost six miles of icing track contemplated in one new group of yards which at present handle somewhat less than one-third of the business in Chicago. Another recent development is an iceless refrigerator car which derives its refrigeration by power drawn from the axle, and the Department of Agriculture has announced the development of a portable device which enables fruit growers and shippers to convert an ordinary refrigerator car into a "pre-cooling plant."

The iceless refrigerator car maintains a constant temperature at any point from zero to freezing, by means of mechanical cold control. The power plant and refrigerating apparatus are contained in a small steel box located just back of the journal from which is derived the power that operates the generators. When the car stops the power stops, and while the car will maintain a given temperature for 72 hours, it is equipped with a supplementary motor which can be attached to any power line.

The portable pre-cooling device weighs 85 pounds and its use allows fruit to be loaded directly in a car from the packing house. It consists of a small electric motor and a high-speed blower. When two of these motor-driven blowers are put into operation in the bunkers of an iced and loaded car, the natural circulation of air is reversed. The cold air is pulled up from the ice compartments at each end of the car and blown out over the top of the load, cooling the top layers much faster than they would be cooled with the natural circulation.

The pre-cooling device has been used for pre-cooling strawberries in North Carolina and Florida, and for peaches in Georgia. More recently it has been used in pre-cooling citrus fruits in Florida. The arrangement saves time and labor for the growers, and in addition it makes possible the cooling of fruit loaded at many small shipping points where no pre-cooling plant is available.

Improved Planting Machinery

Time was when most fine garden seeds were sown between the thumb and finger even in commercial market gardens. Various kinds of garden seed drills pushed by hand were then developed. These could be operated successfully only in carefully prepared soil which contained just the right amount of moisture without clods or coarse vegetable material. Today a tractor draws an implement which throws up three flat-topped ridges with irrigating furrows between, and drills at the same time two rows of lettuce on each ridge. Cabbage plants, similarly, are transplanted or set in the ground by machinery with a rapidity that formerly would have required the services of literally hundreds of hand workers in a single field.

One of the new developments in potato production is a three-row automatic planter. Instead of cultivating with a one-row cultivator, many potato farmers now equip their tractors with vine lifters, and weed with multiple row machinery. One instance is cited of a farmer who rigged up a sprayer to mount on the rear of his tractor and operate from the power shaft, while the forward cultivators could still be used. With this outfit he can spray and cultivate in half the ordinary time. Power take-off boom sprayers have also been adapted for

use with tractors.

Considerable experimentation is being made just now in the use of gases for coloring and preserving products. Laboratory, "pony" refrigerator, and carlot studies have been made by the Federal Bureau of Plant Industry with solid carbon dioxide as a supplementary refrigerant, special attention being given to the effect of the carbon dioxide gas upon the fruit and the fruit rots. The gas given off by the solid carbon dioxide has been found capable of causing practically complete inhibition of both the development of rots and the softening of the fruit almost immediately upon the closing of the car or other container.

Testing raisin grapes with a saccharometer to determine if they have proper sugar content for packing.

This discovery offers tremendous possibilities in the retail packaging of fresh fruits and vegetables which are commonly sold to consumers in bulk. There is a limit, however, according to the investigators, to the period of exposure that the fruit will stand; the greater the concentration of carbon dioxide, the shorter the period of safe exposure. Different fruits vary greatly in their tolerance of carbon dioxide. Strawberries and peaches are very susceptible to injury, whereas grapes are very resistant. The first indication of injury to the fruit is a slight loss of aroma. This is followed by a definite insipidity of taste and finally by the development of distinctly disagreeable flavors.

Better Market Facilities

"One of the most outstanding developments in the fruit and vegetable business in the last five years," according to F. G. Robb, marketing specialist of the Bureau of Agricultural Economics, "is the improvement in wholesale market facilities in many of our principal cities. The Chicago trade has moved from the old cramped quarters along South Water Street to the new South Water Market where it is housed in new stores with all modern conveniences. Two railroads have expended almost $10,000,000 in providing new terminal tracks adjacent to these stores.

"Cleveland has built an $8,000,000 terminal which will handle 95 per cent of the business which was formerly scattered between several yards and wholesale centers. In Pittsburgh the Pennsylvania Railroad has built a new $3,000,000 terminal and auction house on the site of the old produce yards. The unloading and sales platform is 1,200 feet long and 90 feet wide and furnishes space for the display of 225 carloads at one time. The new Detroit Union Produce Terminal cost $5,000,000. In New York City several millions have been spent enlarging and improving the city piers and the Bronx terminal.

"In nearly all of these cities and many others there are relatively new receiving houses built by the chain stores to which cars may be switched without delay in the terminal, and frequently without passing through it. The aggregate of such construc-

Filling a one-row, one-man potato planter with seed and fertilizer, Rockingham county, New Hampshire.

tion is large and shows the growth of this branch of chain stores. Their growing practice of dealing direct with the grower or growers' cooperative has materially affected the business of the jobber and broker in many of our large cities.

"Some of these terminals have had a marked effect upon the method of doing business. Briefly, some of them are sharply restricting the hours of selling, making the hours of business more nearly comparable with those in other industries. Buyers are able to look over more nearly the entire offering of the day before making purchases, but by the early termination of business are compelled to make their decisions with reasonable promptness if they are to secure deliveries that day. The net result seems to tend to equalize matters as between the larger and the smaller firms and as between the older house and the newcomer in the trade.

"Our men in some of the markets express the opinion that the new terminal arrangements have on the average speeded up the rendering of account sales on carlot consignments by at least 24 hours. In some cases there has been a marked effect upon the trade itself. With a definite minimum number of packages which may be sold in some of these new terminals, a number of carlot receivers are discontinuing their jobbing business, while in some markets it has seemed to operate also to decrease the number of jobbers since many buyers who can handle the minimum number of packages now buy in the terminal instead of patronizing the jobber. Small retailers even combine their orders, select one of their number to buy for the group, and then split up the purchase.

"It is generally agreed that all of these changes are in the desired direction and result in the sale of goods more nearly on the basis of real quality, hastened returns to the grower and delivery of goods to the consumer."

Fertilizers for Vegetables

(*From page 25*)

ing that the soil drainage is as satisfactory as conditions permit, the gardener is free to delve further into the more or less mysterious art of using commercial fertilizers to the best possible advantage. He has a right to expect a handsome financial gain from the correct use of such plant foods. Nor is he likely to be disappointed if the job is rightly done.

If the reaction of the soil is such that red clover grows well, conditions, as far as the acid content of the soil is concerned, are just about right for the luxurious growth of vegetables. The soil chemist refers to such a degree of acidity as pH 6. Neutral soil has a pH value of 7 so the gardener reasons that a soil should be just on the alkaline side of the divide for the best development of vegetable crops. A few vegetables require an acid soil.

For clearness of understanding and for briefness of statement, the vegetables will be grouped and the several soil types will be placed in four divisions. By so doing the gardener will be able to more easily fit his particular problem into this more or less general series of recommendations.

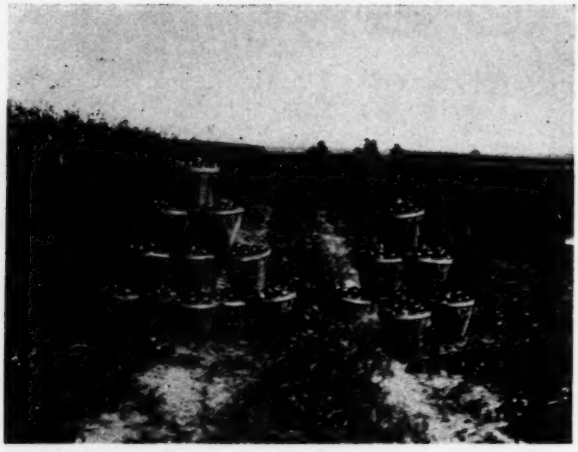
The first of the groups of vegetables contains only the early potato crop. A 6-8-6 fertilizer applied in the row at the rate of 800- to 1,200 pounds per acre is suggested for all light colored soils including sandy soils, silt loams, clay loams, or clays. On dark colored silt loams, clay loams, or clays the analysis might well be a 4-10-6. For the muck and peat soils the potato crop responds well to a 3-9-18. The rate and method of application remain the same for all kinds of soils. Side-dressings of free nitrogen are not found profitable with the potato crop.

The second group includes the late potato crop. On sandy soils the use of a 4-10-6 is found profitable. A 4-12-4 is used on the light colored silt loams, clay loams, and clays. A 2-14-4 analysis is suggested for the darker silt loams, clay loams, and clays. On the mucks and peats the late potato crop uses the same fertilizer as the early crop, namely a 3-9-18. The rate of application and the methods of application are also the same as for the early crop.

The third group of crops includes tomatoes and peppers. This group is the first one on which it is possible to secure worth while returns from the use of top or side-dressings with nitrogen carriers. However it is only when unfavorable growing conditions exist in the spring that such practices are recommended. The rate of application for the early and late crops in this group varies from 500 to 1,200 pounds per acre, but the method in every case calls for a broadcast application. Many a grower has tried out row applications of fertilizer on the tomato crop during wet seasons and found the results more than satisfactory. The next season the results of such a practice are disastrous if the moisture supply is low.

On sandy soils for the early and late crops in this tomato group the analysis is a 4-12-4. On silt, loams, clay loams, or clays of the lighter kind a 4-12-4 is used for the early crop and a 2-14-4 is used for the late crop. On the darker colored silt and clay loams and clays the early crop receives a 2-14-4 and the late crop an 0-14-6. An 0-12-12 is recommended for the mucks and peats.

The fourth group of crops includes cabbage and celery. With such crops the use of 30 to 50 pounds of available nitrogen applied at two-week intervals as needed until the plants are half grown is profitable. If ammonium sulfate is used 30 pounds of free nitrogen will be contained in 150 pounds of the chemical. Other nitrogen carriers can be figured in a simi-



The tomatoes on the left represent the yield from a plot where the potash requirements of this crop were satisfied. The tomatoes on the right were produced on a potash-starved plot.

lar manner.

In every case the cabbage and celery fertilizers are applied broadcast as in the case of the tomato crop. From 800 to 1,200 pounds per acre are advisable. A 4-12-4 fertilizer is used on all but the peats and mucks when a 3-9-18 is used.

The next group including such crops as lettuce and spinach is to receive the same treatment as the cabbage group in every way but one. The exception is in the analysis for mucks and peats. An 0-12-12 is used in place of a 3-9-18.

Other Groups

The root crops such as onions, beets, carrots, and others make up the sixth group. Only in unfavorable seasons is the use of available nitrogen as a side-dressing profitable. These crops are given broadcast applications of fertilizers at the rate of from 500 to 1,000 pounds per acre. A 4-10-6 is used on the sandy soils and a 2-12-6 is recommended for the light colored heavier soils. A 2-14-4 is applied to the dark colored heavy soil types and on the mucks and peats the analysis used is 3-9-18.

Melons and cucumbers form the seventh group and they are given one application of available nitrogen about three weeks after the plants start growth From 30 to 50 pounds are used per acre as a side-dressing. In some cases row applications of 500 pounds of basic fertilizer are used per acre but the preferred method is that of broadcasting 1,000 pounds of a complete fertilizer before the seed is planted.

On sand soils a basic fertilizer treatment consisting of 1,000 pounds of a 4-12-4 is suggested. A 4-12-4 can also be used on the light colored heavy soils. A 2-14-4 is found suitable for the dark colored heavy soil types. On mucks and peats an 0-12-12 is found best.

Beans and peas constitute the eighth group. Like the tomato group and the root crops this group does not return a profit from the use of available nitrogen unless the season is unfavorable. From 300 to 800 pounds per acre of fertilizer applied broadcast is recommended. For all light colored soils a 4-12-4 is used and for dark colored heavy soils a 2-14-4 is recommended. On the mucks and peats an 0-12-12 is best.

The last group consisting of sweet corn calls for 125 to 250 pounds per acre of a 4-12-4 for the light colored soils. A 2-14-4 is used on the dark colored heavy soils and an 0-12-12 is advised for the mucks and peats. All fertilizer is to be applied in the row. Side-dressing of nitrogen is recommended if one application is made three weeks after the plants start growth.

Gardeners should remember that these analyses are merely suggested as a starting point from which to judge the amount and method and time of making applications. There can be no exact rule.

Central Wisconsin Stages a "Comeback"

(*From page* 28)

fully 90 per cent are planted by hand in cross checks so that the field is rowed both ways. Row application of fertilizers on potatoes, of course, ordinarily is done by potato planters with fertilizer attachments.

The potato farmers on these light soils feel that they save considerable machine investment when they use a hand planter costing $1.50 instead of a one or two-row horse planter. They like to plant their two or three acres apiece by hand per day and do it right. They think that fewer hills per acre give them better average yields and eliminate trouble with under-sized potatoes. They dig their crop in a wholesale manner with big, heavy potato-diggers that elevate the vines and potatoes while the soil sifts through the elevator chain-shaker screen. If the sods of the field have not well rotted and disintegrated during the growing season, the crop has been cheated out of some fertility that was planned for it and also the digging is made immeasurably more difficult, especially in a wet season. With 25,000 acres of potatoes in one county, it requires some labor to keep the weeds down and cross cultivation makes that easier.

In arranging the tests there was to be no attempt at planting reforms for the region. Accordingly, a sulky cultivator with fertilizer attachments was fitted up. The good farmers of the section quite generally cultivate their potato fields before the seed pieces have fully sprouted and come through to show the rows. They do this by cultivating the marks which they followed in planting and they speak of it as "blind cultivation." When blind cultivating, they roll the loose top soil in onto the row marks and then drag the ridges down to near the field level. This hastens the rotting of sods and kills weeds. It must be remembered that in these fields of late potatoes, soil processes must happen fast for the sods are often plowed down as late as June 1 and the crop is dug along about October 1, after the early frosts.

By rebuilding the cultivator so that the flexible fertilizer spouts extended down directly behind the inside shovels of the cultivator gangs, the fertilizers were delivered in a steady stream at the very bottom of the grooves made by the inside shovels, which were run as deeply as possible without disturbing the plowed down sods and manure and also close to the seed pieces that had been recently planted in the cross checks along the marked rows.

This system, of course, resulted in feeding the soil as much leachable nitrogen in between the hills of potatoes, which are regularly planted in squares ranging from 34 to 38 inches, as was fed in close proximity to the

The fertilizer was applied with a sulky cultivator which had been fitted up with fertilizer attachments.

hills, but this could not be helped. There was no fear of loss of phosphate and potash from leaching.

In inaugurating these nine exactly similar test plots in the three counties, the same field plan was followed in each case. A check plot of two rows was established and then next came the four, six, or eight-row fertilized plot. Then another two-row check plot was staked off to accompany the next four, six, or eight-row fertilized plot, and so on throughout. This allowed the yield from each fertilized plot to be compared with the unfertilized rows, immediately adjacent. Soil conditions are so often variable in any field that to compare the yield from a plot with that of a check plot several rows or even rods removed is very unsafe and unfair.

The Story Starts

The crop came on. At heavy vine stage the plots could be seen endwise, sidewise, and any old way. Every plot receiving any potash in the fertilized mixture showed lighter green, almost a sickly green along with increased vine growth. The degree of difference in color was almost in proportion to the strength of potash in the analysis. The heavier the potash in the mixture, the lighter the green color.

At mid-growing season, the plots promised some yield difference, if vines were any indication.

When it came harvesting time, the measured areas were dug and handled in the regular manner of hand digging. After the rows were picked separately, they were sorted and the yields calculated.

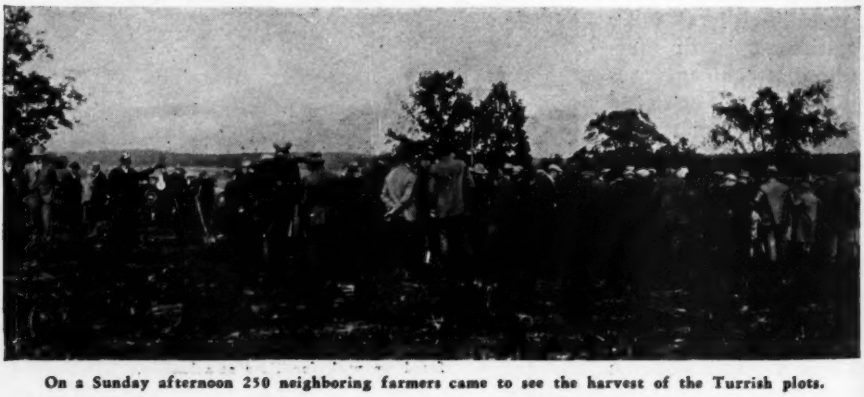
On one of the tests, the fertilized plot produced a gain in No. 1 potatoes from 82 bushels per acre as an average for the check plots to 171 bushels per acre of No. 1's as a result of 400 pounds per acre of a 3-10-30 fertilizer. In a field adjacent to the Hancock Experiment Station, the plot receiving the 3-10-30 fertilizer showed an increase of 56 bushels of No. 1's per acre more than the check plot.

In considering the averages from the nine similar tests in the three counties, the following results are significant:

1.—The 3-10-0 plot yielded no more No. 1's than the check plot, but did yield 2 bushels per acre more No. 2's. The 400 pounds of fertilizer cost $6.59.

2.—The 3-10-10 fertilizer gave a yield of 133 bushels of No. 1's and 19 bushels of No. 2's against the yield of 98 bushels of No. 1's and 22 bushels of No. 2's per acre from the check plot. This gain of 35 bushels of No. 1's per acre was credited to the use of 400 pounds of 3-10-10 fertilizer, costing $8.87, and was worth $36.75 in the local market at harvest time.

3.—The 3-10-20 gave a yield of



On a Sunday afternoon 250 neighboring farmers came to see the harvest of the Turrish plots.

142 bushels of No. 1's and 17 bushels of No. 2's against 101 bushels of No. 1's and 19 bushels of No. 2's per acre from the check plot, or a gain of 41 bushels per acre of No. 1's. The 400 pounds of fertilizer cost $11.14 and the 41-bushel increase of No. 1's was worth $43.05.

4.—The 3-10-30 gave a yield of 145 bushels of No. 1's and only 14 bushels of No. 2's per acre as compared to 96 bushels of No. 1's and 19 bushels of No. 2's per acre on the check plot. This 49-bushel gain in No. 1's per acre was due to 400 pounds of a 3-10-30 fertilizer costing $13.58 and the increase in yield was worth $51.45 on the local market at digging time.

A table more clearly picturing these results follows:

Large numbers of local growers came to see the results of these tests. The cooperating and visiting farmers thought that this was pretty good business from an investment and interest-bearing standpoint.

To be sure, these are only one year's results, but the progressive farmers and potato dealers of the old potato growing section of Wisconsin think they see the handwriting on the wall and they intend to carry on further in this matter of better crop feeding.

AVERAGE Results of NINE Central Wisconsin POTATO Fertilizer TESTS
Sandy Loam Soils of Portage, Waushara, and Waupaca Counties—1929

Treatments	YIELD in bushels per acre No. 1's	No. 2's	INCREASE of No. 1's over nearest check plot	VALUE of increase of No. 1's @ $1.75 per 100 lbs. ($1.05-bu.)	Fertilizer COST per acre	RETURNS per acre above fertilizer cost
Check Plot (Manure only)	99	17	....	....	....	....
Manure and 400 lbs. 3-10-0	99	19	none	none	$6.59	Loss $6.59
Check Plot (Manure only)	98	22	....	....	....	....
Manure and 400 lbs. 3-10-10	133	19	35 bu.	$36.75	$8.87	Gain $27.88
Check Plot (Manure only)	101	19	....	....	....	....
Manure and 400 lbs. 3-10-20	142	17	41 bu.	$43.05	$11.14	Gain $31.91
Check Plot (Manure only)	96	19	....	....	....	....
Manure and 400 lbs. 3-10-30	145	14	49 bu.	$51.45	$13.58	Gain $37.87

Notes: Six (6) of the Test Fields were manured—about 10 tons per acre. Three (3) of the Test Fields were NOT manured but were alfalfa or sweet clover sods.

Calculated per ton cost of fertilizers:

3-10-0	$32.95	3-10-20	$55.70
3-10-10	$44.35	3-10-30	$67.90

TEST FARMS: Edw. Hansen, Amherst; Norman L. Dahlen, Rosholt; Geo. Turrish, Bancroft; Jno. W. Burns & Son, Almond; Homer Hicks, Almond; Jos. Parkin, Hancock; Fred M. Stewart & Son, Wautoma; Frank Grimm, Plainfield; A. D. Larson, Waupaca.

Fertilizers Improve Kentucky Tobacco

(*From page* 16)

after 12 per cent, under these conditions, did not increase the crop.

As a result of these demonstrations for both burley and dark tobacco under the usual conditions, it seems most profitable to use from 300 to 500 pounds of 3-8-12.

The plant food needs of burley and dark tobacco are not exactly the same, however. The burley tobacco grower wants a medium crop of high-priced, high quality tobacco; the dark grower is interested in a thick, dark leaf with plenty of weight.

A thousand pounds of burley tobacco removes more plant food from the soil than does 1,000 pounds of dark tobacco. And since it must grow in considerably less time, burley tobacco needs a greater supply of available plant food. The dark, growing for one or two months longer, can get more of its subsistence from the soil. More than this, quality in a leaf of burley is quite a matter of the amount of oil it contains. The light, oily, "bright," thin leaves are where the quality lies.

Since potash is necessary both in the manufacture of starch in the leaf and to make oil, it is doubly important that fertilizers for tobacco contain an abundant supply of potash.

Better Grapes

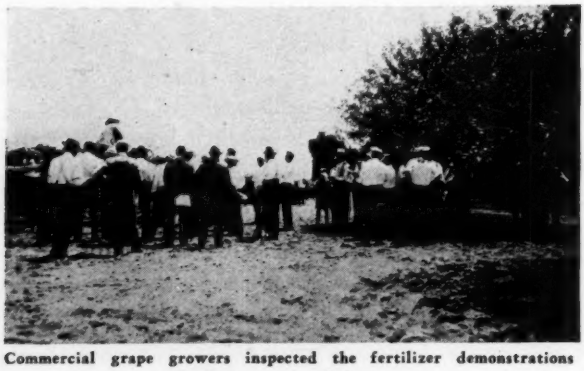
(*From page* 23)

plete fertilizer applied at the rate of 600 pounds per acre.

Edward Todd— Treatment	Lbs Per Vine	Tons Per Acre
Block 1—600 lbs. 2-8-5	6.57	1.59
Block 2—600 lbs. 2-8-5 80 lbs. KC1	8.47	2.05
Block 3—600 lbs. 2-8-5 240 lbs. KC1	7.35	1.78

Although the 1929 results, as shown in Table IV, are not very consistent, they are more or less typical of the reaction to a heavy application of fertilizer followed by a severe dry period such as was experienced in many sections of Kent county this year.

As a result of this experimental and demonstrational work in our grape vineyards, several of our growers have changed their practices of fertilization, and this has been especially true with reference to the use of a higher percentage of potash in the commercial mixtures. The growers realize, now, the value of this material in the growing of high standard grapes.



Commercial grape growers inspected the fertilizer demonstrations in Kent county, Delaware.

The most practical amount of potash to use per acre in grape vineyards depends somewhat upon the soil type, cultural methods, type of pruning, and variety. However, based on the data secured from these experiments and demonstrations, it would seem that in a

complete fertilizer, applied at the rate of from 600 to 800 pounds per acre, the potash content should range from 10 to 15 per cent in order to secure the most profitable returns from the crop in this section of the country.

Potash

(*From page* 10)

muriate of potash in addition, at the rate of 230 pounds per acre. The project also includes a complete mixture applied at three different rates.

In this project, N is equivalent to 200 pounds per acre of nitrate of soda; P equals 120 pounds of treble superphosphate; and K equals 230 pounds of muriate of potash. The complete mixture was applied at the rates of ½(N-P-K), N-P-K, and 2(N-P-K).

The following table gives the average yields of potatoes, oats, and hay for the seven years from 1923 to 1929 inclusive; and also the average yearly increase per acre resulting from each treatment as compared with the yield where no fertilizer was applied.

These results show a striking benefit to the crops from applications of potash. This is especially marked in the case of potatoes and hay. The oat crop shows benefits from nitrogen and phosphate as well as from potash residues. The average annual increase of potatoes for a period of eight years from 230 pounds of muriate of potash applied alone was 70.46 bushels. The increase due to potash when used in combination with 200 pounds of nitrate of soda was 77.01 bushels.

The increase from the muriate of potash when used with 120 pounds of treble superphosphate exceeded the yield from an application of treble superphosphate alone by 104.93 bushels. When muriate of potash was combined with both nitrate of soda and phosphate, the increase due to

COMMERCIAL FERTILIZER PROJECT

With and Without Potash

Treatment	Potatoes		Oats		Hay	
	Yield	Increase	Yield	Increase	Yield	Increase
	Bu.		Bu.		Lbs.	
O	125.74	.....	44.84	...	2670	....
N	131.29	5.55	47.47	2.63	2886	216
N-P	137.49	11.75	52.52	7.68	2860	190
P	111.42	−14.32*	48.08	3.24	2606	−64*
K	196.20	70.46	49.88	5.04	3552	882
N-K	208.30	82.56	49.84	5.00	3880	1210
N-P-K	240.56	114.82	53.93	9.09	3962	1292
P-K	216.35	90.61	52.01	7.17	3736	1066
Average No Potash	126.49	....	48.23	...	2755	....
Ave. with 230 lbs. K.	215.35	88.86	51.41	3.18	3782	1027

RATE OF APPLICATION OF COMPLETE FERTILIZER

O	125.74	....	44.84	...	2670	....
½(N-P-K)	183.12	57.38	47.58	2.74	3016	346
N-P-K	240.56	114.82	53.93	9.09	3962	1292
2(N-P-K)	247.46	121.72	56.84	12.00	4140	1470

*Decrease per acre as compared with the plot receiving no treatment.

potash was 103.07 bushels per acre. These results indicate that the potash is more potent when combined with phosphates than when applied either alone or only with nitrate of soda.

The average increase from 230 pounds of muriate of potash per acre for all treatments was 88.87 bushels, since the yield from all treatments without the potash was 126.49 bushels and with the potash it was 215.35 bushels. In the case of the complete mixture, the ratios between the rate of application and the increase in yield were the same up to 230 pounds of muriate of potash per acre. The double treatment, 2(N-P-K) gave a much smaller proportional return, indicating that 200 pounds of nitrate of soda, 120 pounds of treble superphosphate, and 230 pounds of muriate of potash are probably close to the optimum rate under the conditions of this project.

Residual Effects

The second-year residual effects on oats from the different treatments show definite benefits not only from the potash, but also from nitrogen and phosphate as well. In the case of the hay crop, there is apparently little or no benefit to it from the nitrogen and phosphate residues, but the yield is very materially increased by the potash applied three years previous. The average increase of hay from the 230 pounds of muriate of potash applied on the potato crop two years previous, was 1,027 pounds per acre. Taking the average yields from all treatments where potash was not included, and comparing them with the yield from all treatments exactly similar, except for the addition of 230 pounds of potash per acre, we find the average annual increase, over an eight-year period, 1923-1929 inclusive, from an addition of 230 pounds of potash per acre, was 88.86 bushels of potatoes, 3.18 bushels of oats and 1,027 pounds of hay.

Previous to 1929 we had assumed that potash functioned in two ways to increase the yield of potatoes. First, as a tissue building material whose presence in adequate quantities enables the potato plant to place in its tubers a large store of nutriments with which to propagate its species. Second, that potash is an essential active agent in the assimilation processes of the potato plant.

Potash Prevents Disease

Another role that potash plays in the life process of this plant was definitely demonstrated during the severe drought in July and early August in 1929, by the behavior or condition of the potato vines on the plots not treated with potash. Besides the very dark green color and warping of the leaves, apparent in previous years on the plots receiving no potash, local wilt areas, sometimes on the leaves but more often on the stems, were noticed. On August 5 the field was photographed when about 10 to 20 per cent of the plants appeared diseased.

Specimen plants were taken and sent to the Division of Plant Pathology of the University of Minnesota. Dr. J. G. Leach of that department reported as follow: "These plants are quite evidently affected with fusarium wilt. Some of the drying of the leaves may also be due to injury from leaf hoppers, as I found them quite numerous on the plants."

By August 15 almost every plant on the non-potash treatment plots was either wilting or withered, while the vines on adjacent plots treated with potash were maturing normally with no sign of injury or disease except where the applications were less than 125 pounds of muriate of potash per acre.

We conclude therefore, that potash plays a triple role as a benefactor for the potato crop; first, as a plant food substance; second, as an active agent in the assimilation processes; and third, as a disease preventative.

Top-dressing Cotton

(*From page* 17)

with extra potash in 1929?

Over in northern Alabama Mr. John R. Witt at Belle Mina has two fields of 20 acres each situated between his home and the highway, with a private road between. On these fields about six crops of vetch have been turned under during the last 10 years and the soil is a Decatur clay loam—just the place where one would think extra potash would not pay on cotton. In 1928 Mr. Witt applied 50 pounds of muriate of potash per acre as a top-dresser, in addition to his regular fertilizer, to one of the fields and it produced two bales of cotton more than the other. But Mr. Witt was skeptical about extra potash because his land was so red and contained so much clay. Then, too, his neighbors didn't quite believe the extra gain was due to potash. So in 1929 Mr. Witt switched fields and applied the same amount of extra potash on the other side of the road. The field with the extra potash made three bales more than the other field.

Over in North Carolina in 1929, Mr. W. G. Edwards at Seaboard fertilized his cotton with 800 pounds of 12-3-3 (PNK) per acre at planting and then top-dressed each acre with 300 pounds of 0-12-16 (PNK). Mr. Edwards said, "I made 520 bales on 728 acres under adverse weather conditions and heavy boll-weevil infestation. The extra potash stopped rust, lessened shedding, and gave more uniform staple and better yields." Mr. W. D. Barbee, a neighbor of Mr. Edwards, used the same fertilizer and produced 251 bales on 300 acres.

Mr. Z. V. Pate of Laurinburg, North Carolina, in 1928 conducted a demonstration with extra potash on cotton, the results of which are shown in the accompanying photograph. In 1929 Mr. Pate fertilized 669 acres of cotton on one of his farms with 800 pounds of 8-5-3 (PNK) per acre at planting and 200 pounds of 0-14-15 as a top-dresser. On another of his farms he fertilized 553 acres of cotton with 800 pounds of 8-4-4 (PNK) at planting and top-dressed with 200 pounds of 0-9-15. Mr. Pate is not only a large farmer but one of North Carolina's most influential fertilizer men. He is using and selling much more potash than his section has ever known before. In 1930 he will increase the potash content of the tobacco fertilizer used on his own farms by 5 per cent.

Mr. C. S. Sealy at Edison, Georgia, said in October, 1929, "I have for the past two years used a top-dresser for cotton, analyzing 0-9-10 (PNK), on a 30-horse farm of mine. I intend to use the same top-dresser next year on my entire 60-horse farm. This top-dresser followed a liberal application of commercial fertilizer, analyzing 12-3-5 (PNK). I would not farm unless I could get potash to go in the top-dresser."

Non-conformists

(*From page* 4)

tic originality. The farmer adopts commonplace slang from the tenderloin or the dance hall without any attempt at alteration. The country contents itself with trivial expressions borrowed from the city, because to

create new bon mots would be undignified for the craft. We seemingly have outgrown the Lincolnesque epoch of verbal virility.

The secret of the farmer's change lies in his literature, his lessons, and his environment. They are all directed at one objective, namely, to convince him that he is a business man, a capitalist, an executive; that he is a cog in a machine well oiled with efficiency and equipped with a regulation self-starter, hot spark, and steady clutch — by all means, the clutch!

OPEN derision is the share of him who feels an inherited hankering for the sentimental things of the soil, or who perhaps, has held onto a few legends and customs that were cherished by the misguided fathers. Hemmed in on the one side by lunch clubbers and demonstrators, and shamed into submission on the other hand by the grubbing labor of foreign-born neighbors, the descendant of the original settler finds it increasingly hard to keep his individuality. This is not confined to the mellow South, either. He tells himself feebly that he lives on the old homestead because he loves it. Right well he must know by this time, with all the information given to him, that his only mission on earth is to "produce economically" and "market cooperatively." That has been repeated so often that it is bound to be true.

He cannot escape it. His mail box is daily stuffed with the printed slogan. Demonstrators invade his corn field and spoil his peace of mind with talk of fertilizers and marl. His own farm as well as all the farms in his bailiwick is bored, blasted, mapped, and checked. His kine are scoffed at by societies of registration and discounted by the State. He accepts at last the obvious fact that life is a race for profits, and that he who owns the land is but a time server for the ultimate consumer and a trustee for unborn generations.

He leans on the gate with a wisp of straw in his jaws and watches the big parade. It is urged that farming be made a serious business. Some reformers want it to develop into a machine-like drag of precision and precept. They are utterly Calvinistic, declaring that there is no room for such antics as barn raisings and husking bees. They insist that one eye must be glued to the milk sheet and the other riveted to the market page.

Have work and diversion, sweat and sentiment, he asks, no companion parts in the duty which the made-over agriculturist has in this high-geared age? The plowboy who stops in his furrow to hunt for a bird's nest should not be wholly replaced by the new model who stays away from the swimming hole to fit prize calves for the Rotary junior round-up.

HE imagines that Youth can improve without being impoverished. He asks, "In the process of becoming standardized are we going to lose altogether certain worthwhile charms?"

The literature, lessons, and environment that are aimed at the elevation of the submerged farm sentimentalist culminate in the craze for organization. Organization is universal and usually inescapable. By the same token, it is easier to get joined up promiscuously in agriculture than to stay organized.

Battering down the walls of farm isolation was the earliest movement toward rural amalgamation. That was the reason advanced before the hectic day of the pool, the exchange, and the iron-clad contract. It was the social urge, mixed with Populist politics, that created the earlier propaganda societies, with a little pomp and mystic ritual thrown in for good measure by such sober agencies as the Grange.

In those innocent days of pioneer farming there was little to alarm the

provincial mind. A joiner had all the freedom of a church member or a lodge brother—that is, he could be circumspect or ritualistic, as the case might be, at meeting time, and do as he pleased in the intervals.

He was merely a recruit in the parading home guard while the battle was attended to mostly by Congressmen. But since 1918 the deadly do or die gas attacks have been rolling into the trenches. Hence the farmer's drill sergeants have sent harsher tactics for the producer to master and for the home guards to muster under.

This is the age of technical aid to farm advancement. The higher the cost, the better the service—that's the non-conformist's idea of it. For example take the lawyer's part in the new era of farm solidarity. Time was when attorneys were avoided except in dire cases of line fence wrangles or at the dramatic hour of making deeds, mortgages, or wills. The old order saw in the attorney an individual friend or a vengeful enemy—but never an overmastering agency that must enter into all personal affairs of barter and trade.

Collective bargaining and commodity sales systems are the pet terms with the farm economic crowd that harass our beleagured old-timer. In either of these systems we find the business attorney on top of the restless heap. He is the Grand Kleagle of the Korn Kob Klan. Author and arbiter of their weighty contracts and testamentary documents, the skillful commercial lawyer wins if they win—and loses nothing if they fail, except a slightly s h e l f - worn reputation! Equally at home in all phases of the game, he eases his clients into pools and bureaus, and just as cheerfully officiates at their economic obsequies.

Other consipirators against the rural peace of mind are department chiefs, publicity harriers, budget makers, and similar brothers of botheration. They are bent, he thinks, upon dinning the

500,000 Farmers

Have Borrowed from the 12 Mutual Federal Land Banks a Billion and a Half Dollars at an average interest rate of 5.4%

THIS $1,500,000,000 in long-term loans secured by first mortgages on their farms provided much needed capital during a period when funds were scarce and the average farm income low. All but a small percentage of these farmers have met their obligations. The 12 Banks have total capital, legal and other reserves and undivided profits aggregating more than $84,000,000. Their total assets exceed $1,300,000,000. The net carrying value of the real estate, sheriffs' certificates and similar items owned by the 12 banks on November 30, 1929, was only 1.1% of their assets.

The services of the 12 Banks and the National Farm Loan Associations through which the loans are made have been of inestimable benefit and they will increase in the future.

The 12 Federal Land Banks are located at

Springfield, Mass.	New Orleans, La.	Wichita, Kan.
Baltimore, Md.	St. Louis, Mo.	Houston, Tex.
Columbia, S. C.	St. Paul, Minn.	Berkeley, Calif.
Louisville, Ky.	Omaha, Nebr.	Spokane, Wash.

get-together rivets into the temple of farm security. And preceding them all, like John the Baptist, come the gaunt and unquenchable zealots of salvation—the paid and free-will organizers!

I have a friend in that class. He is not small of vision or picayunish. He will not dabble with the school district or the township or the county; he intends to organize the farmers of the world! He will first separate them by commodities and weld them together with the aforesaid legal help. Then he will proceed to federate the commodity groups for righteous revenge upon the middle men and special privileges. He is not concerned with men, mind you; he is thinking of the goods, the moneys, and the markets; and for quite a spell he will not awaken from his trance.

During this period many of his neighbors who *do* think of men have drifted in and out of various farm organizations and are neither wiser nor sadder for it, albeit somewhat robbed of repose.

HOW to make farm organizations function for those who have got mighty sick of the doses they once swallowed is the problem facing the uplift brigade.

That all this pressure and persuasion is part of a well-meaning conspiracy with no ulterior motive behind it, we have no doubt. The farming business is sick, the conspirators say, and the clinic must prescribe. If the farming business expires, it shall not be for want of good treatment and advice. One death after a major operation, they aver, is more to the nation's credit than a life-long tussle in a shanty with delerium tremens and the ague!

On every hand the intolerant friends lecture the contented reactionary and lose patience with him for his old-fogey notions. But many of the palliatives that they offer hint of bitter bile. So the conservative provincial mind hearkens to the voice of Sancho Panza and cares not to spur his spavined Rocinante into the bold tournaments of trade.

Granted that he is a back number, a drag on the road to progress, an echo of the vanished past—still, mindful that the likes of him helped make our country, we pause and give him obituary and decent burial.

He lived in an age of hand-planters, sheet-iron stoves, horse-drawn vehicles, flannel underwear, and other miseries, and yet withal he was not openly rebellious or frequently peevish. His place is taken by the uproarious, much-abused, and luxury-loving yeoman, who must have action all the time and plenty of it.

IN some remote places not reached by reformers, the old-timer dies hard. He is far tougher and more resistant than he has any right to be. How many more cussings, campaigns, and calamities will it require to change the "Last of the Mohicans" into one of the Six Best Sellers? In other words, when will the last contented farmer disappear from the good green earth?

Perhaps it isn't permitted for humanity on the land ever to wrap himself in complete content. Even the one who balks at the multiple hitch in farm affairs may not be completely content with his own domain.

Yet is seems to me that I can recall times at home when budgets and balance sheets were not the main theme around the fireside. Possibly it is even so with some folks on the modern homesteads of today. If such is the case, then my fling amid the quack-infested fields of our old backward brother is not entirely amiss.

Somewhere it seems to me that Emerson rejoices in the independence of the non-conformist. But if anyone prefers to be a non-conformist just to be different, I am not with him. But to be a lover of sentiment as well as success—that kind of objector is kin of mine!

Little Help

Mother—"When that naughty boy threw stones at you, why didn't you come and tell me instead of throwing them back at him?"

Willie—"What good would it do to tell you? You couldn't hit the side of a barn."

A colored man got his nerve together and took a flight in an aeroplane. As he climbed out of the ship on its return to the field, he turned to the pilot and said:

"Suh, ah has to thank you fo' both dem rides."

"What are you talking about?" said the aviator. "You only had one."

"No, suh," returned the passenger, "Ah done had two—mah fust an' mah last."

Diary of a College Grad

June 23, 1929—Graduated today.

June 28, 1929—Looked for a $10,000 job.

July 20, 1929—Looked for a job at $100 a week.

August 9, 1929—Looked for any kind of a job.

September 2, 1929—Still looking.

September 23, 1929—Went to work for my uncle for $75 a month.

"Officer," said a 300-pound lady, "could you see me across the street?"

"Madam, I could see you three blocks away."

Saxophone Player (after finishing number): "What was that we just played?"

No Help Offered

Rastus was devouring an apple, which he seemed to enjoy to his highest satisfaction.

Sambo: "Say dere, boy, you'd better look out for worms in dat dar apple."

Rastus: "Lissen heah, buddy, when ah eats apples de worms have to look out for themselves."

"Have you brought many people to your way of thinking?" "No," answered Senator Sorghum. "Public opinion is something like a mule I owned when I was a boy. In order to keep up the appearance of being driver I had to watch the way he was going and follow on behind."—*Washington Star.*

Giving Himself Up

"Offisher, you'd better lock me up. Jush hit my wife over the head wish a club."

"Did you kill her?"

"Don't think sho. Thash why I want to be locked up."

He Would Say That!

New Yorker (incredulously): "And you mean to say that in California you have 365 days of sunshine a year?"

The Man from Los Angeles: "Exactly so, sir, and that's a mighty conservative estimate."

Anxious Sufferer

"Doctor, how soon do you think I shall be well enough to eat things that don't agree with me?"

If You Like Arithmetic

Figure out for some of your farmer friends the amount of actual potash they apply per acre. The last figure in a fertilizer analysis indicates the percentage of potash in the mixture. To compute the number of pounds of potash used per acre in fertilizers, multiply this figure as per cent by the number of pounds of fertilizer used per acre. For example, 300 lbs. of 2-12-6 fertilizer supplies .06x300 = 18 lbs. of potash; 300 lbs. of 4-24-12 fertilizer supplies .12x 300 = 36 lbs. of potash. When you have found the amount of potash applied in each case compare this with the potash taken out of the soil by crops, as shown by the table at right. It will be interesting both to you and to your farmer friends to know just how their crop withdrawals of potash compare with their potash applications in fertilizers.

Approximate Amounts of Potash Removed Per Acre

Crop	Yield	Pounds of Potash Removed
Wheat	30 Bus.	9
Wheat Straw	1½ Tons.	22
Oats	60 Bus.	11
Oats Straw	1½ Tons.	45
Rye	25 Bus.	8
Rye Straw	1¼ Tons.	20
Barley	40 Bus.	14
Barley Straw	1¼ Tons.	30
Corn	75 Bus.	26
Corn Stover	2 Tons.	37
Timothy	2 Tons.	68
Clover	2½ Tons.	82
Alfalfa	4 Tons.	178
Soy Bean Hay	3 Tons.	140
Sweet Clover	4 Tons.	148
Sugar Beets	15 Tons.	111
Sweet Corn	3 Tons.	18
Cabbage	12 Tons.	104
Potatoes	250 Bus.	80
Tomatoes	10 Tons.	70
Onions	600 Bus.	66
Tobacco Leaves	1500 Lbs.	90
Tobacco Stems	1250 Lbs.	87.3

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